AD NO. _____
DTC PROJECT NO. 8-CO-160-UXO-021
REPORT NO. ATC-9091

STANDARDIZED

UXO TECHNOLOGY DEMONSTRATION SITE

OPEN FIELD SCORING RECORD NO. 305

SITE LOCATION:
U.S. ARMY ABERDEEN PROVING GROUND

DEMONSTRATOR:
ENGINEERING RESEARCH AND
DEVELOPMENT CENTER (ERDC)
3909 HALLS FERRY ROAD
VICKSBURG, MS 39180-6199

TECHNOLOGY TYPE/PLATFORM:
EM63/PUSHCART

PREPARED BY:
U.S. ARMY ABERDEEN TEST CENTER
ABERDEEN PROVING GROUND, MD 21005-5059

SEPTEMBER 2005

Prepared for:
U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MD 21010-5401

U.S. ARMY DEVELOPMENTAL TEST COMMAND
ABERDEEN PROVING GROUND, MD 21005-5055

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14. ABSTRACT
This scoring record documents the efforts of Engineering Research and Development Center (ERDC) to detect and discriminate inert unexploded ordnance (UXO) utilizing the APG Standardized UXO Technology Demonstration Site Open Field. Scoring Records have been coordinated by Larry Overbay and the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include, the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.

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SECTION 1. GENERAL INFORMATION

1.1 BACKGROUND

Technologies under development for the detection and discrimination of unexploded ordnance (UXO) require testing so that their performance can be characterized. To that end, Standardized Test Sites have been developed at Aberdeen Proving Ground (APG), Maryland and U.S. Army Yuma Proving Ground (YPG), Arizona. These test sites provide a diversity of geology, climate, terrain, and weather as well as diversity in ordnance and clutter. Testing at these sites is independently administered and analyzed by the government for the purposes of characterizing technologies, tracking performance with system development, comparing performance of different systems, and comparing performance in different environments.

The Standardized UXO Technology Demonstration Site Program is a multi-agency program spearheaded by the U.S. Army Environmental Center (AEC). The U.S. Army Aberdeen Test Center (ATC) and the U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC) provide programmatic support. The program is being funded and supported by the Environmental Security Technology Certification Program (ESTCP), the Strategic Environmental Research and Development Program (SERDP) and the Army Environmental Quality Technology Program (EQT).

1.2 SCORING OBJECTIVES

The objective in the Standardized UXO Technology Demonstration Site Program is to evaluate the detection and discrimination capabilities of a given technology under various field and soil conditions. Inert munitions and clutter items are positioned in various orientations and depths in the ground.

The evaluation objectives are as follows:

a. To determine detection and discrimination effectiveness under realistic scenarios that vary targets, geology, clutter, topography, and vegetation.

b. To determine cost, time, and manpower requirements to operate the technology.

c. To determine demonstrator's ability to analyze survey data in a timely manner and provide prioritized "Target Lists" with associated confidence levels.

d. To provide independent site management to enable the collection of high quality, ground-truth, geo-referenced data for post-demonstration analysis.

1.2.1 Scoring Methodology

a. The scoring of the demonstrator's performance is conducted in two stages. These two stages are termed the RESPONSE STAGE and DISCRIMINATION STAGE. For both stages, the probability of detection (P_d) and the false alarms are reported as receiver-operating

characteristic (ROC) curves. False alarms are divided into those anomalies that correspond to emplaced clutter items, measuring the probability of false positive (P_{fp}), and those that do not correspond to any known item, termed background alarms.

b. The RESPONSE STAGE scoring evaluates the ability of the system to detect emplaced targets without regard to ability to discriminate ordnance from other anomalies. For the blind grid RESPONSE STAGE, the demonstrator provides the scoring committee with a target response from each and every grid square along with a noise level below which target responses are deemed insufficient to warrant further investigation. This list is generated with minimal processing and, since a value is provided for every grid square, will include signals both above and below the system noise level.

c. The DISCRIMINATION STAGE evaluates the demonstrator's ability to correctly identify ordnance as such and to reject clutter. For the blind grid DISCRIMINATION STAGE, the demonstrator provides the scoring committee with the output of the algorithms applied in the discrimination-stage processing for each grid square. The values in this list are prioritized based on the demonstrator's determination that a grid square is likely to contain ordnance. Thus, higher output values are indicative of higher confidence that an ordnance item is present at the specified location. For digital signal processing, priority ranking is based on algorithm output. For other discrimination approaches, priority ranking is based on human (subjective) judgment. The demonstrator also specifies the threshold in the prioritized ranking that provides optimum performance, (i.e. that is expected to retain all detected ordnance and rejects the maximum amount of clutter).

d. The demonstrator is also scored on EFFICIENCY and REJECTION RATIO, which measures the effectiveness of the discrimination stage processing. The goal of discrimination is to retain the greatest number of ordnance detections from the anomaly list, while rejecting the maximum number of anomalies arising from non-ordnance items. EFFICIENCY measures the fraction of detected ordnance retained after discrimination, while the REJECTION RATIO measures the fraction of false alarms rejected. Both measures are defined relative to performance at the demonstrator-supplied level below which all responses are considered noise, i.e., the maximum ordnance detectable by the sensor and its accompanying false positive rate or background alarm rate.

e. Based on configuration of the ground truth at the standardized sites and the defined scoring methodology, there exists the possibility of having anomalies within overlapping halos and/or multiple anomalies within halos. In these cases, the following scoring logic is implemented:

(1) In situations where multiple anomalies exist within a single R_{halo}, the anomaly with the strongest response or highest ranking will be assigned to that particular ground truth item.

(2) For overlapping R_{halo} situations, ordnance has precedence over clutter. The anomaly with the strongest response or highest ranking that is closest to the center of a particular ground truth item gets assigned to that item. Remaining anomalies are retained until all matching is complete.

(3) Anomalies located within any R_{halo} that do not get associated with a particular ground truth item are thrown out and are not considered in the analysis.

f. All scoring factors are generated utilizing the Standardized UXO Probability and Plot Program, version 3.1.1.

1.2.2 Scoring Factors

Factors to be measured and evaluated as part of this demonstration include:

a. Response Stage ROC curves:

(1) Probability of Detection (P_d^{res}).

(2) Probability of False Positive (P_{fp}^{res}).

(3) Background Alarm Rate (BAR^{res}) or Probability of Background Alarm (P_{BA}^{res}).

b. Discrimination Stage ROC curves:

(1) Probability of Detection (P_d^{disc}).

(2) Probability of False Positive (P_{fp}^{disc}).

(3) Background Alarm Rate (BAR^{disc}) or Probability of Background Alarm (P_{BA}^{disc}).

c. Metrics:

(1) Efficiency (E).

(2) False Positive Rejection Rate (R_{fp}).

(3) Background Alarm Rejection Rate (R_{BA}).

d. Other:

(1) Probability of Detection by Size and Depth.

(2) Classification by type (i.e., 20-, 40-, 105-mm, etc.).

(3) Location accuracy.

(4) Equipment setup, calibration time and corresponding man-hour requirements.

(5) Survey time and corresponding man-hour requirements.

(6) Reacquisition/resurvey time and man-hour requirements (if any).

(7) Downtime due to system malfunctions and maintenance requirements.

1.3 STANDARD AND NONSTANDARD INERT ORDNANCE TARGETS

The standard and nonstandard ordnance items emplaced in the test areas are listed in Table 1. Standardized targets are members of a set of specific ordnance items that have identical properties to all other items in the set (caliber, configuration, size, weight, aspect ratio, material, filler, magnetic remanence, and nomenclature). Nonstandard targets are inert ordnance items having properties that differ from those in the set of standardized targets.

TABLE 1. INERT ORDNANCE TARGETS

Standard Type	Nonstandard (NS)
20-mm Projectile M55	20-mm Projectile M55
	20-mm Projectile M97
40-mm Grenades M385	40-mm Grenades M385
40-mm Projectile MKII Bodies	40-mm Projectile M813
BDU-28 Submunition	
BLU-26 Submunition	
M42 Submunition	
57-mm Projectile APC M86	
60-mm Mortar M49A3	60-mm Mortar (JPG)
	60-mm Mortar M49
2.75-inch Rocket M230	2.75-inch Rocket M230
	2.75-inch Rocket XM229
MK 118 ROCKEYE	
81-mm Mortar M374	81-mm Mortar (JPG)
	81-mm Mortar M374
105-mm Heat Rounds M456	
105-mm Projectile M60	105-mm Projectile M60
155-mm Projectile M483A1	155-mm Projectile M483A
	500-lb Bomb

JPG = Jefferson Proving Ground
HEAT = high-explosive, antitank

SECTION 2. DEMONSTRATION

2.1 DEMONSTRATOR INFORMATION

2.1.1 Demonstrator Point of Contact (POC) and Address

POC: Mr. Ryan E. North
601-634-3486
ryan.e.north@erdc.usace.army.mil

Address: Engineering Research and Development Center (ERDC)
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

2.1.2 System Description (provided by demonstrator)

The EM63 is a commercially available sensor (produced by Geonics, Ltd., of Mississauga, Ontario, Canada who also produces the EM61). It is a high power, high sensitivity, wide bandwidth full time domain UXO detector. The EM63 consists of a powerful transmitter that generates a pulsed primary magnetic field which induces eddy currents in nearby metallic objects. The time decay of the currents is accurately measured over a wide dynamic range of time. The output of the main sensor is measured and recorded by the main console at 20 to 30 geometrically spaced time gates, depending on the used repetition rate, covering a time range from 180 μs to 63 ms. The second receiver coil, axially mounted with the main coil, is used for target depth determination. The acquisition is either free running or controlled by wheel odometer or manual fiducial.

The EM63 system consists of three major hardware subsystems.

1. EM63 Control Console Sub-System.

2. Antenna Cart Sub-System.

3. GPS Navigation Sub-System.

The EM63 Control Console Sub-System consists of receiver and transmitter unit, controlled by an integrated field computer. The control console also houses the system battery.

The Antenna Cart Sub-System consists of the transmitter antenna (the 1- by 1-meter bottom coil) and receiver coils.

The GPS Navigation Sub-System. Local positioning and georeferencing of the Geonics EM63 system is accomplished using a Trimble 5700 real time kinematic (RTK) Global Positioning System (GPS) system. The Trimble system consists of two receivers that are in radio communication with each other. A roving GPS antenna is mounted in the center of the EM63 coils and two meters above the bottom coil. The operator or assistant carries the controller for

the roving antenna (fig. 1). The antenna is positioned so that it minimizes any influence on the EM63. The roving GPS system constantly receives corrections to the GPS signal from the base station.

Figure 1. Demonstrator's system, EM63/pushcart.

2.1.3 Data Processing Description (provided by demonstrator)

EM63 and GPS data are merged in real-time in the control console. The EM63 output files will be processed with Geonics' proprietary DAT63W software to convert the files from binary to American Standard Code for Information Interchange (ASCII). The ASCII data files will be imported into Geosoft's Oasis Montaj. No corrections are required for positioning since the GPS antenna is centered with respect to the coils. The EM63 files will be combined in Oasis to create one file per area. The resulting area files exported by Oasis meet the requirements of the raw sensor data that must be delivered at the end of the demonstration. The following processing steps will be performed in Oasis:

1. Background removal or leveling.

2. Map generation.

3. Target picking.

2.1.4 Data Submission Format

Data were submitted for scoring in accordance with data submission protocols outlined in the Standardized UXO Technology Demonstration Site Handbook. These submitted data are not included in this report in order to protect ground truth information.

2.1.5 Demonstrator Quality Assurance (QA) and Quality Control (QC) (provided by demonstrator)

QA: We will perform four levels of QC checks: the first day of the project, the beginning of each day, multiple times each day, and whenever we change equipment. The first day of the project we will lay out a 10-meter-long line oriented north-south with a 3-inch steel sphere at the center. This line will be well marked and used each time we test the instrument and positioning. We will collect data on the line with and without navigation equipment attached to the EM63 to test for a direct current (DC) shift from the navigation equipment. Then we will test for instrument response over the steel sphere, as well as a position check and a latency check. We will walk the line slowly in two directions and then back the cart up until it is centered on the sphere. This will set the location of the sphere as well as the instrument response, which will be used every time we check the equipment.

Each morning we will perform functional equipment checks. We will visually inspect all equipment for damage. After assembling the equipment and powering up, we will check all of the cable connections for shorts or broken pinouts. If any shorts or pinouts are found, the broken cable will be marked and removed from service. We will then perform some static and instrument response tests to ensure that the data are stable when the instrument is in a static position over a marked location. These tests will be performed after the instrument has had sufficient time to warm up.

Every time we change batteries or dump data, we will repeat the instrument test, the positioning test, and the latency test. If we change equipment, we will repeat all of the previous tests.

QC: We will use the 0.5-meter line spacing on all grids and record a reading every 0.1 meter in-line. We will test the estimated accuracy of the navigation system when we run the latency, positioning, and instrument response test over the steel sphere. We will compare the peak while moving with the position established during the first-day QC checks.

2.1.6 Additional Records

The following record(s) by this vendor can be accessed via the Internet as MicroSoft Word documents at www.uxotestsites.org. The Blind Grid counterpart to this report is Scoring Record No. 304.

2.2 APG SITE INFORMATION

2.2.1 Location

The APG Standardized Test Site is located within a secured range area of the Aberdeen Area. The Aberdeen Area of APG is located approximately 30 miles northeast of Baltimore at the northern end of the Chesapeake Bay. The Standardized Test Site encompasses 17 acres of upland and lowland flats, woods and wetlands.

2.2.2 Soil Type

According to the soils survey conducted for the entire area of APG in 1998, the test site consists primarily of Elkton Series type soil (ref 2). The Elkton Series consist of very deep, slowly permeable, poorly drained soils. These soils formed in silty aeolin sediments and the underlying loamy alluvial and marine sediments. They are on upland and lowland flats and in depressions of the Mid-Atlantic Coastal Plain. Slopes range from 0 to 2 percent.

ERDC conducted a site-specific analysis in May of 2002 (ref 3). The results basically matched the soil survey mentioned above. Seventy percent of the samples taken were classified as silty loam. The majority (77 percent) of the soil samples had a measured water content between 15- and 30-percent with the water content decreasing slightly with depth.

For more details concerning the soil properties at the APG test site, go to www.uxotestsites.org on the web to view the entire soils description report.

2.2.3 Test Areas

A description of the test site areas at APG is included in Table 2.

TABLE 2. TEST SITE AREAS

Area	Description
Calibration Grid	Contains 14 standard ordnance items buried in six positions at various angles and depths to allow demonstrator to calibrate their equipment.
Blind Test Grid	Contains 400 grid cells in a 0.2-hectare (0.5 acre) site. The center of each grid cell contains ordnance, clutter or nothing.
Open Field	A 4-hectare (10-acre) site containing open areas, dips, ruts and obstructions that challenge platform systems or hand held detectors. The challenges include a gravel road, wet areas and trees. The vegetation height varies from 15 to 25 cm.

SECTION 3. FIELD DATA

3.1 DATE OF FIELD ACTIVITIES (30 March through 29 April 2004)

3.2 AREAS TESTED/NUMBER OF HOURS

Areas tested and total number of hours operated at each site are summarized in Table 3.

TABLE 3. AREAS TESTED AND NUMBER OF HOURS

Area	Number of Hours
Calibration Lanes	8.42
Open Field	140.66

3.3 TEST CONDITIONS

3.3.1 Weather Conditions

An APG weather station located approximately one mile west of the test site was used to record average temperature and precipitation on a half hour basis for each day of operation. The temperatures listed in Table 4 represent the average temperature during field operations from 0700 to 1700 hours while precipitation data represents a daily total amount of rainfall. Hourly weather logs used to generate this summary are provided in Appendix B.

TABLE 4. TEMPERATURE/PRECIPITATION DATA SUMMARY

Date, 2004	Average Temperature, °F	Total Daily Precipitation, in.
30 March	41.85	0.04
31 March	46.64	0.10
1 April	49.10	1.03
2 April	46.39	0.69
3 April	47.20	0.04
4 April	43.66	0.21
5 April	37.98	0.00
6 April	48.55	0.00
7 April	64.87	0.00
8 April	49.39	0.02
9 April	57.32	0.03
10 April	55.36	0.00
11 April	46.46	0.02
12 April	47.28	1.15

TABLE 4. (CONT'D)

Date, 2004	Average Temperature, °F	Total Daily Precipitation, in.
13 April	49.45	0.40
14 April	51.19	0.14
15 April	55.89	0.01
16April	55.66	0.00
17 April	65.43	0.00
18 April	76.40	0.00
19 April	76.19	0.00
20 April	72.25	0.00
21 April	63.16	0.00
22 April	73.65	0.00
23 April	73.75	0.15
24 April	66.28	0.00
25 April	57.54	0.00
26 April	63.65	0.72
27 April	61.05	0.00
28 April	52.69	0.00
29 April	61.74	0.00

3.3.2 Field Conditions

ERDC surveyed the Blind Grid on 31 March and 1 April. The Calibration Lane and Blind Grid had several muddy areas due to rain prior and during testing. ERDC surveyed the Open Field from 30 March through 29 April. Several areas of the Open Field were in standing water throughout the survey. Those include the area surrounding the fence challenge, the southeast portion of the wet area, and the border area of the Open Field and Wooded scenario.

3.3.3 Soil Moisture

Three soil probes were placed at various locations within the site to capture soil moisture data: Blind Grid, Calibration, Mogul, and Wooded areas. Measurements were collected in percent moisture and were taken twice daily (morning and afternoon) from five different soil depths (1 to 6 in., 6 to 12 in., 12 to 24 in., 24 to 36 in., and 36 to 48 in.) from each probe. Soil moisture logs are included in Appendix C.

3.4 FIELD ACTIVITIES

3.4.1 Setup/Mobilization

These activities included initial mobilization and daily equipment preparation and break down. A two-person crew took 2 hours and 40 minutes to perform the initial setup and mobilization. There was 40 hours and 40 minutes of daily equipment preparation, and end of the day equipment break down lasted 8 hours and 35 minutes.

3.4.2 Calibration

ERDC spent a total of 8 hours and 25 minutes in the calibration lanes, of which 3 hours and 45 minutes was spent collecting data. An additional 8 hours and 55 minutes was also spent calibrating in the open field.

3.4.3 Downtime Occasions

Occasions of downtime are grouped into five categories: equipment/data checks or equipment maintenance, equipment failure and repair, weather, Demonstration Site issues, or breaks/lunch. All downtime is included for the purposes of calculating labor costs (section 5) except for downtime due to Demonstration Site issues. Demonstration Site issues, while noted in the Daily Log, are considered non-chargeable downtime for the purposes of calculating labor costs and are not discussed. Breaks and lunches are discussed in this section and billed to the total Site Survey area.

3.4.3.1 Equipment/data checks, maintenance. Equipment data checks and maintenance activities accounted for 17 hours and 30 minutes of site usage time. These activities included changing out batteries and routine data checks to ensure the data was being properly recorded/collected. ERDC spent an additional 10 hours and 55 minutes for breaks and lunches.

3.4.3.2 Equipment failure or repair. No time was needed to resolve equipment failures that occurred while surveying the Open Field.

3.4.3.3 Weather. No weather delays occurred during the survey.

3.4.4 Data Collection

ERDC spent a total time of 140 hours and 40 minutes in the Open Field area, 63 hours of which was spent collecting data.

3.4.5 Demobilization

The ERDC survey crew went on to conduct a full demonstration of the site. Therefore, demobilization did not occur until 28 through 29 April 2004. On those days, it took the crew 2 hours and 45 minutes to break down and pack up their equipment.

3.5 PROCESSING TIME

ERDC submitted the raw data from the demonstration activities on the last day of the demonstration, as required. The scoring submittal data was also provided within the required 30-day timeframe.

3.6 DEMONSTRATOR'S FIELD PERSONNEL

Supervisor: Ryan North
Data Analyst: Troy Brosten
Field Support: Eric Smith, Don Yule

3.7 DEMONSTRATOR'S FIELD SURVEYING METHOD

ERDC surveyed the Open Field laying out string 2 meters apart in a 50 meter by 50 meter squares. ERDC surveyed one grid, downloaded and checked that information, and then went on to the next grid. ERDC picked the grids with the least standing water, then gradually moved on to the grids that were wet.

3.8 SUMMARY OF DAILY LOGS

Daily logs capture all field activities during this demonstration and are located in Appendix D. Activities pertinent to this specific demonstration are indicated in highlighted text.

SECTION 4. TECHNICAL PERFORMANCE RESULTS

4.1 ROC CURVES USING ALL ORDNANCE CATEGORIES

Figure 2 shows the probability of detection for the response stage (P_d^{res}) and the discrimination stage (P_d^{disc}) versus their respective probability of false positive. Figure 3 shows both probabilities plotted against their respective background alarm rate. Both figures use horizontal lines to illustrate the performance of the demonstrator at two demonstrator-specified points: at the system noise level for the response stage, representing the point below which targets are not considered detectable, and at the demonstrator's recommended threshold level for the discrimination stage, defining the subset of targets the demonstrator would recommend digging based on discrimination. Note that all points have been rounded to protect the ground truth.

The Demonstrator did not apply any discrimination algorithms, therefore the following ROC curves do not contain discrimination data.

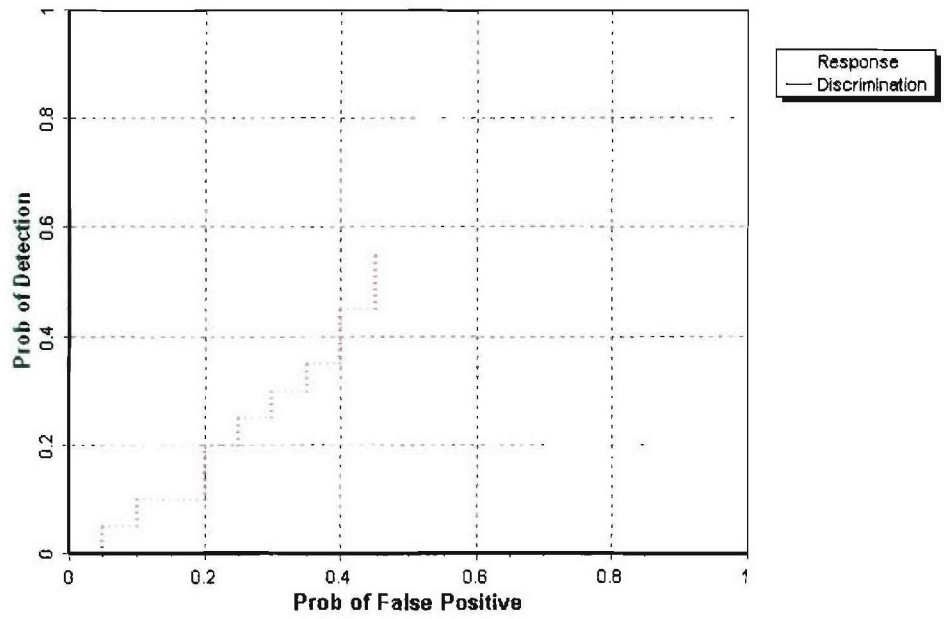

Figure 2. EM63/pushcart Open Field probability of detection for response and discrimination stages versus their respective probability of false positive over all ordnance categories combined.

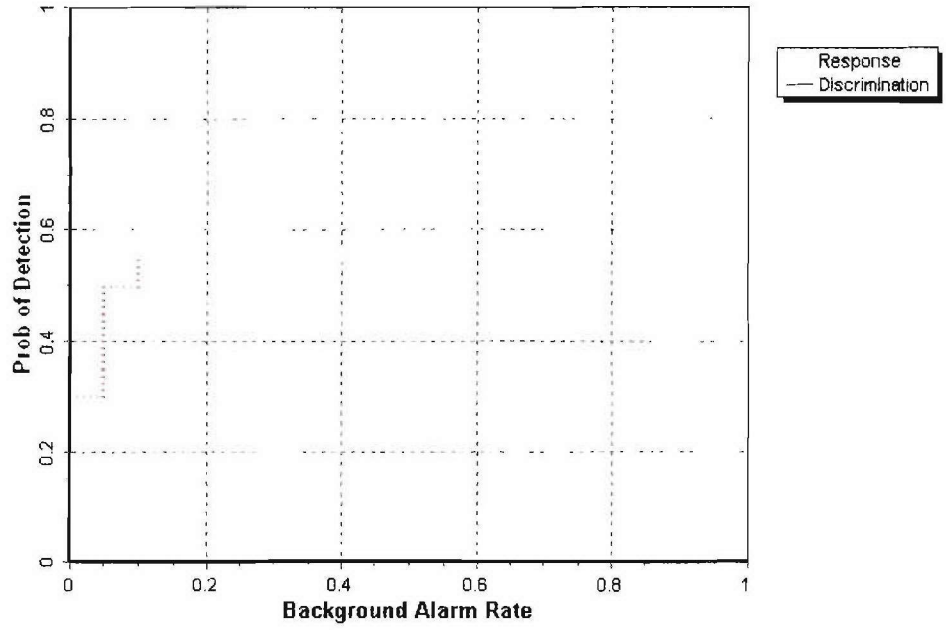

Figure 3. EM63/pushcart Open Field probability of detection for response and discrimination stages versus their respective background alarm rate over all ordnance categories combined.

4.2 ROC CURVES USING ORDNANCE LARGER THAN 20 MM

Figure 4 shows the probability of detection for the response stage (P_d^{res}) and the discrimination stage (P_d^{disc}) versus their respective probability of false positive when only targets larger than 20 mm are scored. Figure 5 shows both probabilities plotted against their respective background alarm rate. Both figures use horizontal lines to illustrate the performance of the demonstrator at two demonstrator-specified points: at the system noise level for the response stage, representing the point below which targets are not considered detectable, and at the demonstrator's recommended threshold level for the discrimination stage, defining the subset of targets the demonstrator would recommend digging based on discrimination. Note that all points have been rounded to protect the ground truth.

The Demonstrator did not apply any discrimination algorithms, therefore the following ROC curves do not contain discrimination data.

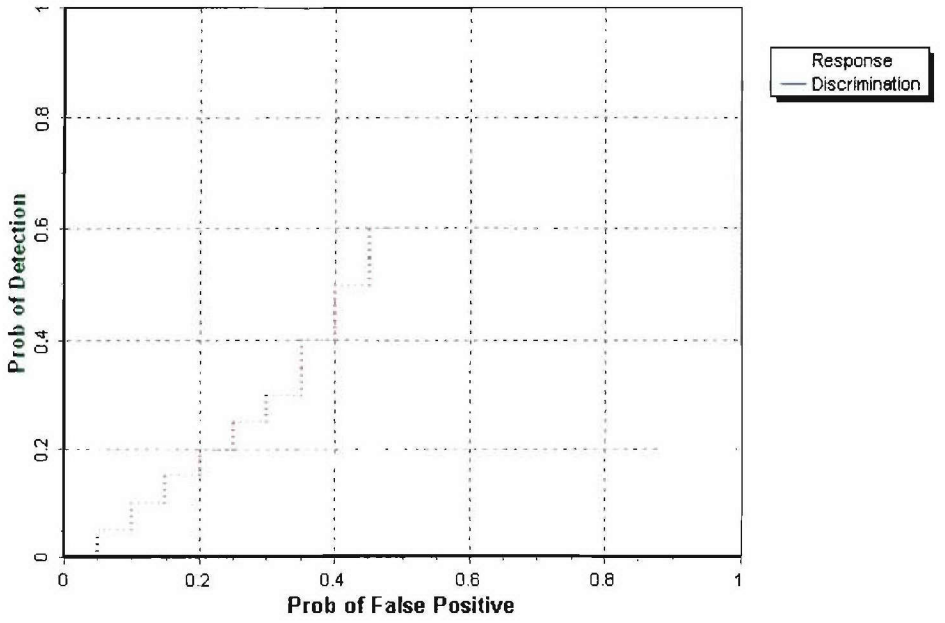

Figure 4. EM63/pushcart Open Field probability of detection for response and discrimination stages versus their respective probability of false positive for all ordnance larger than 20 mm.

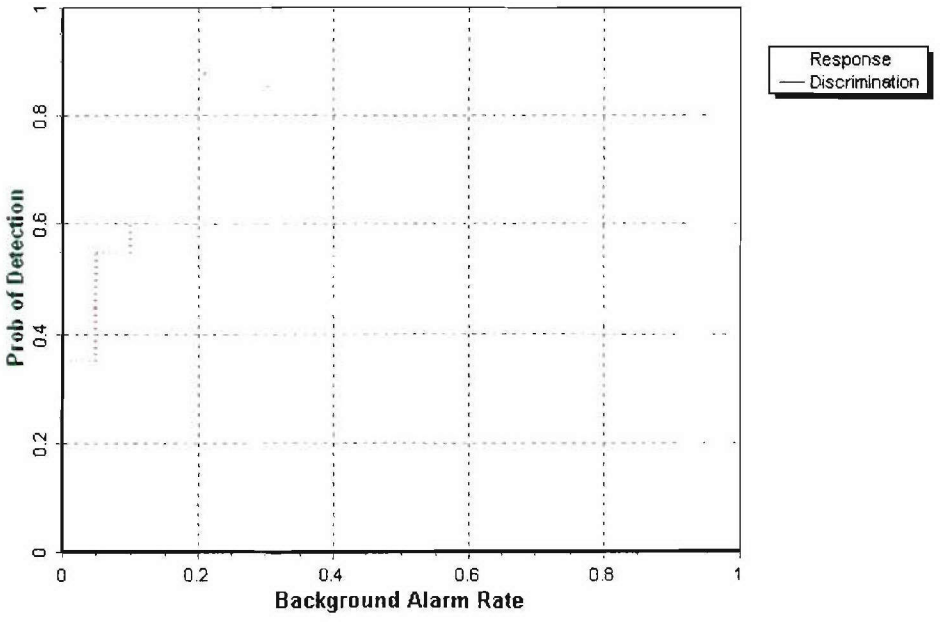

Figure 5. EM63/pushcart Open Field probability of detection for response and discrimination stages versus their respective background alarm rate for all ordnance larger than 20 mm.

4.3 PERFORMANCE SUMMARIES

Results for the Open Field test broken out by size, depth and nonstandard ordnance are presented in Table 5 (for cost results, see section 5). Results by size and depth include both standard and nonstandard ordnance. The results by size show how well the demonstrator did at detecting/discriminating ordnance of a certain caliber range (see app A for size definitions). The results are relative to the number of ordnance items emplaced. Depth is measured from the geometric center of anomalies.

The RESPONSE STAGE results are derived from the list of anomalies above the demonstrator-provided noise level. The results for the DISCRIMINATION STAGE are derived from the demonstrator's recommended threshold for optimizing UXO field cleanup by minimizing false digs and maximizing ordnance recovery. The lower 90-percent confidence limit on probability of detection and P_{fp} was calculated assuming that the number of detections and false positives are binomially distributed random variables. All results in Table 5 have been rounded to protect the ground truth. However, lower confidence limits were calculated using actual results.

TABLE 5. SUMMARY OF OPEN FIELD RESULTS FOR EM63/PUSHCART

Metric	Overall	Standard	Nonstandard	By Size			By Depth, m		
				Small	Medium	Large	< 0.3	0.3 to <1	>= 1
RESPONSE STAGE									
P_d	0.55	0.60	0.50	0.55	0.60	0.55	0.75	0.55	0.15
P_d Low 90% Conf	0.53	0.57	0.43	0.50	0.53	0.45	0.70	0.48	0.09
P_d Upper 90% Conf	0.60	0.66	0.55	0.61	0.65	0.61	0.79	0.61	0.22
P_{fp}	0.50	-	-	-	-	-	0.45	0.50	0.45
P_{fp} Low 90% Conf	0.46	-	-	-	-	-	0.42	0.47	0.26
P_{fp} Upper 90% Conf	0.50	-	-	-	-	-	0.49	0.53	0.62
BAR	0.10	-	-	-	-	-	-	-	-
DISCRIMINATION STAGE									
P_d	NA	NA	NA	NA	NA	NA	NA	NA	NA
P_d Low 90% Conf	NA	NA	NA	NA	NA	NA	NA	NA	NA
P_d Upper 90% Conf	NA	NA	NA	NA	NA	NA	NA	NA	NA
P_{fp}	NA	-	-	-	-	-	NA	NA	NA
P_{fp} Low 90% Conf	NA	-	-	-	-	-	NA	NA	NA
P_{fp} Upper 90% Conf	NA	-	-	-	-	-	NA	NA	NA
BAR	NA	-	-	-	-	-	-	-	-

Response Stage Noise Level: 5.00
Recommended Discrimination Stage Threshold: 0.05

Note: The recommended discrimination stage threshold values are provided by the demonstrator.
No discrimination algorithm was applied. Therefore, the discrimination stage results are not applicable.

4.4 EFFICIENCY, REJECTION RATES, AND TYPE CLASSIFICATION

The Demonstrator did not apply any discrimination algorithms, therefore, the following tables presented in this section are not applicable.

Efficiency and rejection rates are calculated to quantify the discrimination ability at specific points of interest on the ROC curve: (1) at the point where no decrease in P_d is suffered (i.e., the efficiency is by definition equal to one) and (2) at the operator selected threshold. These values are reported in Table 6.

TABLE 6. EFFICIENCY AND REJECTION RATES

	Efficiency (E)	False Positive Rejection Rate	Background Alarm Rejection Rate
At Operating Point	NA	NA	NA
With No Loss of P_d	NA	NA	NA

At the demonstrator's recommended setting, the ordnance items that were detected and correctly discriminated were further scored on whether their correct type could be identified (table 7). Correct type examples include "20-mm projectile, 105-mm HEAT Projectile, and 2.75-inch Rocket". A list of the standard type declaration required for each ordnance item was provided to demonstrators prior to testing. For example, the standard type for the three example items are 20mmP, 105H, and 2.75in, respectively.

TABLE 7. CORRECT TYPE CLASSIFICATION OF TARGETS CORRECTLY DISCRIMINATED AS UXO

Size	Percentage Correct
Small	NA
Medium	NA
Large	NA
Overall	NA

4.5 LOCATION ACCURACY

The mean location error and standard deviations appear in Table 8. These calculations are based on average missed depth for ordnance correctly identified in the discrimination stage. Depths are measured from the closest point of the ordnance to the surface. For the Blind Grid, only depth errors are calculated, since (X, Y) positions are known to be the centers of each grid square.

TABLE 8. MEAN LOCATION ERROR AND STANDARD DEVIATION (M)

	Mean	Standard Deviation
Northing	0.02	0.17
Easting	0.00	0.18
Depth	NA	NA

Note: The demonstrator did not attempt to declare depth of detection.

SECTION 5. ON-SITE LABOR COSTS

A standardized estimate for labor costs associated with this effort was calculated as follows: the first person at the test site was designated "supervisor", the second person was designated "data analyst", and the third and following personnel were considered "field support". Standardized hourly labor rates were charged by title: supervisor at $95.00/hour, data analyst at $57.00/hour, and field support at $28.50/hour.

Government representatives monitored on-site activity. All on-site activities were grouped into one of ten categories: initial setup/mobilization, daily setup/stop, calibration, collecting data, downtime due to break/lunch, downtime due to equipment failure, downtime due to equipment/data checks or maintenance, downtime due to weather, downtime due to demonstration site issue, or demobilization. See Appendix D for the daily activity log. See section 3.4 for a summary of field activities.

The standardized cost estimate associated with the labor needed to perform the field activities is presented in Table 9. Note that calibration time includes time spent in the Calibration Lanes as well as field calibrations. "Site survey time" includes daily setup/stop time, collecting data, breaks/lunch, downtime due to equipment/data checks or maintenance, downtime due to failure, and downtime due to weather.

TABLE 9. ON-SITE LABOR COSTS

	No. People	Hourly Wage	Hours	Cost
Initial Setup				
Supervisor	1	$95.00	2.66	$252.70
Data Analyst	1	57.00	2.66	151.62
Field Support	0	28.50	2.66	0.00
SubTotal				**$404.32**
Calibration				
Supervisor	1	$95.00	17.33	$1,646.35
Data Analyst	1	57.00	17.33	987.81
Field Support	1	28.50	17.33	493.91
SubTotal				**$3,128.07**
Site Survey				
Supervisor	1	$95.00	140.66	$13,362.70
Data Analyst	1	57.00	140.66	8,017.62
Field Support	1	28.50	140.66	4,008.81
SubTotal				**$25,389.13**

See notes at end of table.

TABLE 9 (CONT'D)

	No. People	Hourly Wage	Hours	Cost
Demobilization				
Supervisor	1	$95.00	2.75	$261.25
Data Analyst	1	57.00	2.75	156.75
Field Support	1	28.50	2.75	78.38
Subtotal				**$496.38**
Total				**$29,417.90**

Notes: Calibration time includes time spent in the Calibration Lanes as well as calibration before each data run.

Site Survey time includes daily setup/stop time, collecting data, breaks/lunch, downtime due to system maintenance, failure, and weather.

SECTION 6. COMPARISON OF RESULTS TO BLIND GRID DEMONSTRATION

6.1 SUMMARY OF RESULTS FROM BLIND GRID DEMONSTRATION

Table 10 shows the results from Blind Grid survey conducted prior to surveying the Open Field during the same site visit in April of 2004. For more details on the Blind Grid survey results reference section 2.1.6.

TABLE 10. SUMMARY OF BLIND GRID RESULTS FOR THE EM63/PUSHCART

Metric	Overall	Standard	Nonstandard	By Size			By Depth, m		
				Small	Medium	Large	< 0.3	0.3 to <1	>= 1
RESPONSE STAGE									
P_d	0.75	0.85	0.65	0.80	0.70	0.90	0.95	0.70	0.30
P_d Low 90% Conf	0.69	0.76	0.50	0.68	0.55	0.66	0.87	0.59	0.13
P_d Upper 90% Conf	0.82	0.91	0.74	0.87	0.79	0.99	0.99	0.83	0.49
P_{fp}	0.80	-	-	-	-	-	0.75	0.80	1.00
P_{fp} Low 90% Conf	0.72	-	-	-	-	-	0.67	0.68	0.63
P_{fp} Upper 90% Conf	0.84	-	-	-	-	-	0.85	0.87	1.00
P_{ba}	0.05	-	-	-	-	-	-	-	-
DISCRIMINATION STAGE									
P_d	NA	NA	NA	NA	NA	NA	NA	NA	NA
P_d Low 90% Conf	NA	NA	NA	NA	NA	NA	NA	NA	NA
P_d Upper 90% Conf	NA	NA	NA	NA	NA	NA	NA	NA	NA
P_{fp}	NA	-	-	-	-	-	NA	NA	NA
P_{fp} Low 90% Conf	NA	-	-	-	-	-	NA	NA	NA
P_{fp} Upper 90% Conf	NA	-	-	-	-	-	NA	NA	NA
P_{ba}	NA	-	-	-	-	-	-	-	-

6.2 COMPARISON OF ROC CURVES USING ALL ORDNANCE CATEGORIES

Figure 6 shows P_d^{res} versus the respective P_{fp} over all ordnance categories. Figure 7 shows P_d^{disc} versus their respective P_{fp} over all ordnance categories. Figure 7 uses horizontal lines to illustrate the performance of the demonstrator at the recommended discrimination threshold levels, defining the subset of targets the demonstrator would recommend digging based on discrimination.

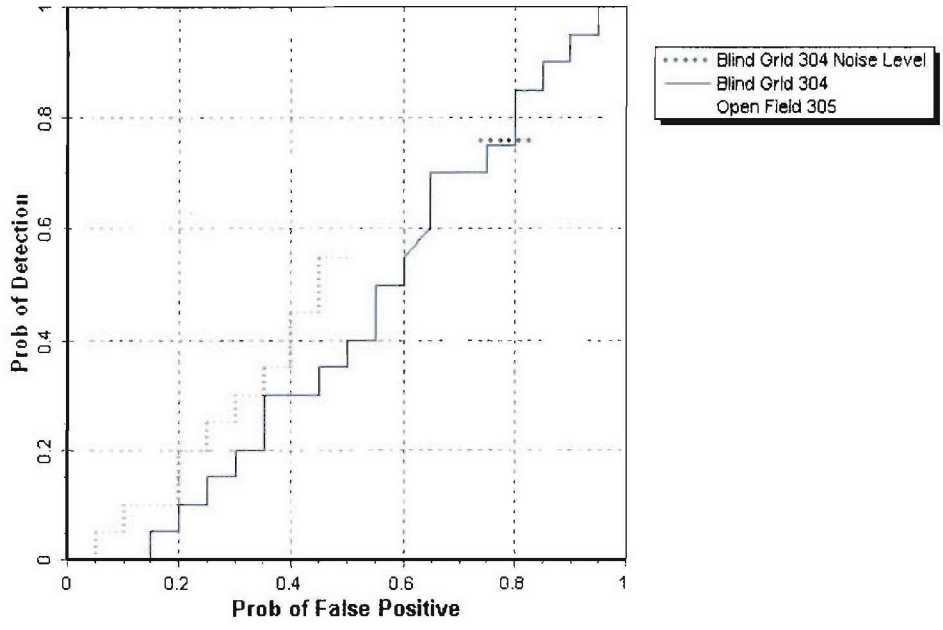

Figure 6. EM63/pushcart P_d^{res} stages versus the respective P_{fp} over all ordnance categories combined.

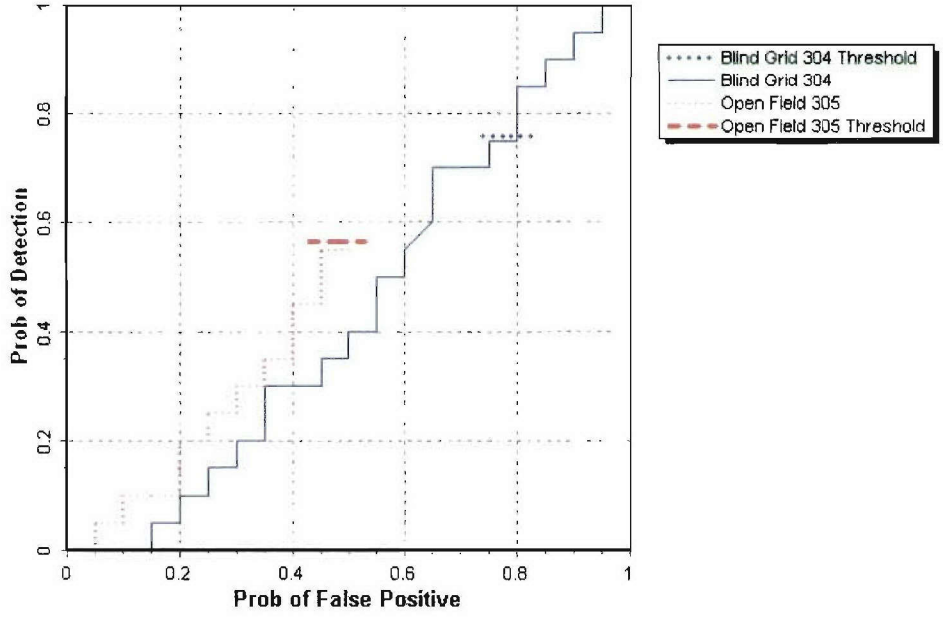

Figure 7. EM63/pushcart P_d^{disc} versus the respective P_{fp} over all ordnance categories combined.

6.3 COMPARISON OF ROC CURVES USING ORDNANCE LARGER THAN 20 MM

Figure 8 shows the P_d^{res} versus the respective probability of P_{fp} over ordnance larger than 20 mm. Figure 9 shows P_d^{disc} versus the respective P_{fp} over ordnance larger than 20 mm. Figure 9 uses horizontal lines to illustrate the performance of the demonstrator at the recommended discrimination threshold levels, defining the subset of targets the demonstrator would recommend digging based on discrimination.

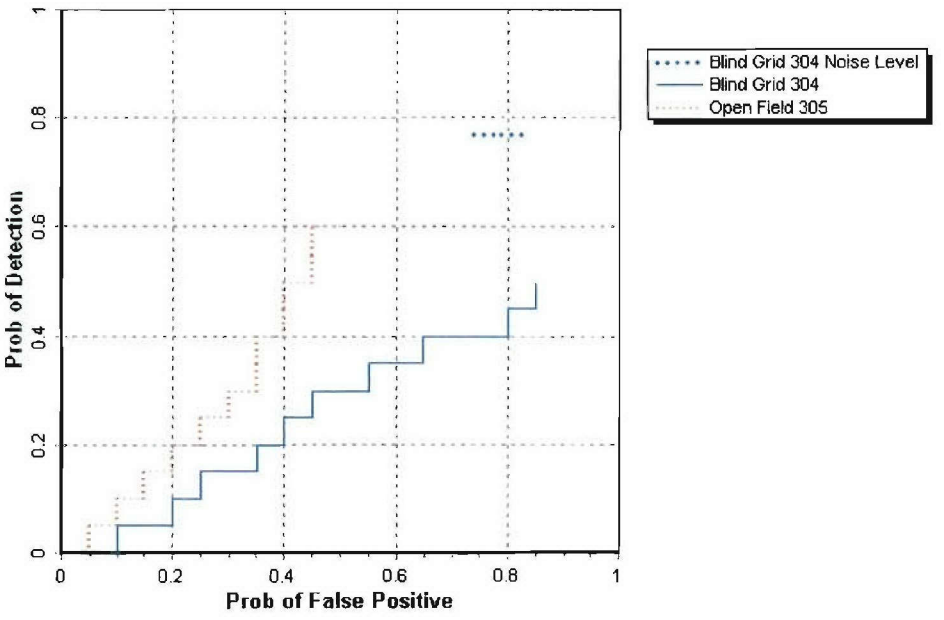

Figure 8. EM63/pushcart P_d^{res} versus the respective P_{fp} for ordnance larger than 20 mm.

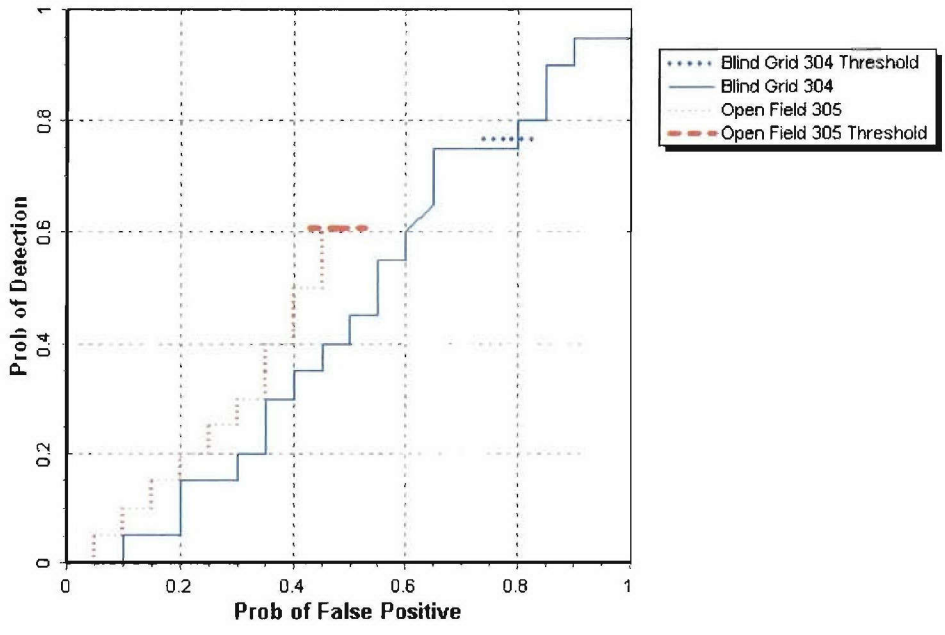

Figure 9. EM63/pushcart P_d^{disc} versus the respective P_{fp} for ordnance larger than 20 mm.

6.4 STATISTICAL COMPARISONS

Statistical Chi-square significance tests were used to compare results between the Blind Grid and Open Field scenarios. The intent of the comparison is to determine if the feature introduced in each scenario has a degrading effect on the performance of the sensor system. However, any modifications in the UXO sensor system during the test, like changes in the processing or changes in the selection of the operating threshold, will also contribute to performance differences.

The Chi-square test for comparison between ratios was used at a significance level of 0.05 to compare Blind Grid to Open Field with regard to P_d^{res}, P_d^{disc}, P_{fp}^{res} and P_{fp}^{disc}, Efficiency and Rejection Rate. These results are presented in Table 11. A detailed explanation and example of the Chi-square application is located in Appendix A.

TABLE 11. CHI-SQUARE RESULTS - BLIND GRID VERSUS OPEN FIELD

Metric	Small	Medium	Large	Overall
P_d^{res}	Significant	Not Significant	Significant	Significant
P_d^{disc}	NA	NA	NA	NA
P_{fp}^{res}	Not Significant	Not Significant	Not Significant	Not Significant
P_{fp}^{disc}	-	-	-	NA
Efficiency	-	-	-	NA
Rejection rate	-	-	-	NA

(Page 26 Blank)

SECTION 7. APPENDIXES

APPENDIX A. TERMS AND DEFINITIONS

GENERAL DEFINITIONS

Anomaly: Location of a system response deemed to warrant further investigation by the demonstrator for consideration as an emplaced ordnance item.

Detection: An anomaly location that is within R_{halo} of an emplaced ordnance item.

Emplaced Ordnance: An ordnance item buried by the government at a specified location in the test site.

Emplaced Clutter: A clutter item (i.e., non-ordnance item) buried by the government at a specified location in the test site.

R_{halo}: A pre-determined radius about the periphery of an emplaced item (clutter or ordnance) within which a location identified by the demonstrator as being of interest is considered to be a response from that item. If multiple declarations lie within R_{halo} of any item (clutter or ordnance), the declaration with the highest signal output within the R_{halo} will be utilized. For the purpose of this program, a circular halo 0.5 meters in radius will be placed around the center of the object for all clutter and ordnance items less than 0.6 meters in length. When ordnance items are longer than 0.6 meters, the halo becomes an ellipse where the minor axis remains 1 meter and the major axis is equal to the length of the ordnance plus 1 meter.

Small Ordnance: Caliber of ordnance less than or equal to 40 mm (includes 20-mm projectile, 40-mm projectile, submunitions BLU-26, BLU-63, and M42).

Medium Ordnance: Caliber of ordnance greater than 40 mm and less than or equal to 81 mm (includes 57-mm projectile, 60-mm mortar, 2.75 in. Rocket, MK118 Rockeye, 81-mm mortar).

Large Ordnance: Caliber of ordnance greater than 81 mm (includes 105-mm HEAT, 105-mm projectile, 155-mm projectile, 500-pound bomb).

Shallow: Items buried less than 0.3 meter below ground surface.

Medium: Items buried greater than or equal to 0.3 meter and less than 1 meter below ground surface.

Deep: Items buried greater than or equal to 1 meter below ground surface.

Response Stage Noise Level: The level that represents the point below which anomalies are not considered detectable. Demonstrators are required to provide the recommended noise level for the Blind Grid test area.

Discrimination Stage Threshold: The demonstrator selected threshold level that they believe provides optimum performance of the system by retaining all detectable ordnance and rejecting the maximum amount of clutter. This level defines the subset of anomalies the demonstrator would recommend digging based on discrimination.

Binomially Distributed Random Variable: A random variable of the type which has only two possible outcomes, say success and failure, is repeated for n independent trials with the probability p of success and the probability 1-p of failure being the same for each trial. The number of successes x observed in the n trials is an estimate of p and is considered to be a binomially distributed random variable.

RESPONSE AND DISCRIMINATION STAGE DATA

The scoring of the demonstrator's performance is conducted in two stages. These two stages are termed the RESPONSE STAGE and DISCRIMINATION STAGE. For both stages, the probability of detection (P_d) and the false alarms are reported as receiver operating characteristic (ROC) curves. False alarms are divided into those anomalies that correspond to emplaced clutter items, measuring the probability of false positive (P_{fp}) and those that do not correspond to any known item, termed background alarms.

The RESPONSE STAGE scoring evaluates the ability of the system to detect emplaced targets without regard to ability to discriminate ordnance from other anomalies. For the RESPONSE STAGE, the demonstrator provides the scoring committee with the location and signal strength of all anomalies that the demonstrator has deemed sufficient to warrant further investigation and/or processing as potential emplaced ordnance items. This list is generated with minimal processing (e.g., this list will include all signals above the system noise threshold). As such, it represents the most inclusive list of anomalies.

The DISCRIMINATION STAGE evaluates the demonstrator's ability to correctly identify ordnance as such, and to reject clutter. For the same locations as in the RESPONSE STAGE anomaly list, the DISCRIMINATION STAGE list contains the output of the algorithms applied in the discrimination-stage processing. This list is prioritized based on the demonstrator's determination that an anomaly location is likely to contain ordnance. Thus, higher output values are indicative of higher confidence that an ordnance item is present at the specified location. For electronic signal processing, priority ranking is based on algorithm output. For other systems, priority ranking is based on human judgment. The demonstrator also selects the threshold that the demonstrator believes will provide "optimum" system performance, (i.e., that retains all the detected ordnance and rejects the maximum amount of clutter).

Note: The two lists provided by the demonstrator contain identical numbers of potential target locations. They differ only in the priority ranking of the declarations.

RESPONSE STAGE DEFINITIONS

Response Stage Probability of Detection (P_d^{res}): P_d^{res} = (No. of response-stage detections)/ (No. of emplaced ordnance in the test site).

Response Stage False Positive (fp^{res}): An anomaly location that is within R_{halo} of an emplaced clutter item.

Response Stage Probability of False Positive (P_{fp}^{res}): P_{fp}^{res} = (No. of response-stage false positives)/(No. of emplaced clutter items).

Response Stage Background Alarm (ba^{res}): An anomaly in a blind grid cell that contains neither emplaced ordnance nor an emplaced clutter item. An anomaly location in the open field or scenarios that is outside R_{halo} of any emplaced ordnance or emplaced clutter item.

Response Stage Probability of Background Alarm (P_{ba}^{res}): Blind Grid only: P_{ba}^{res} = (No. of response-stage background alarms)/(No. of empty grid locations).

Response Stage Background Alarm Rate (BAR^{res}): Open Field only: BAR^{res} = (No. of response-stage background alarms)/(arbitrary constant).

Note that the quantities P_d^{res}, P_{fp}^{res}, P_{ba}^{res}, and BAR^{res} are functions of t^{res}, the threshold applied to the response-stage signal strength. These quantities can therefore be written as $P_d^{res}(t^{res})$, $P_{fp}^{res}(t^{res})$, $P_{ba}^{res}(t^{res})$, and $BAR^{res}(t^{res})$.

DISCRIMINATION STAGE DEFINITIONS

Discrimination: The application of a signal processing algorithm or human judgment to response-stage data that discriminates ordnance from clutter. Discrimination should identify anomalies that the demonstrator has high confidence correspond to ordnance, as well as those that the demonstrator has high confidence correspond to nonordnance or background returns. The former should be ranked with highest priority and the latter with lowest.

Discrimination Stage Probability of Detection (P_d^{disc}): P_d^{disc} = (No. of discrimination-stage detections)/(No. of emplaced ordnance in the test site).

Discrimination Stage False Positive (fp^{disc}): An anomaly location that is within R_{halo} of an emplaced clutter item.

Discrimination Stage Probability of False Positive (P_{fp}^{disc}): P_{fp}^{disc} = (No. of discrimination stage false positives)/(No. of emplaced clutter items).

Discrimination Stage Background Alarm (ba^{disc}): An anomaly in a blind grid cell that contains neither emplaced ordnance nor an emplaced clutter item. An anomaly location in the open field or scenarios that is outside R_{halo} of any emplaced ordnance or emplaced clutter item.

Discrimination Stage Probability of Background Alarm (P_{ba}^{disc}): P_{ba}^{disc} = (No. of discrimination-stage background alarms)/(No. of empty grid locations).

Discrimination Stage Background Alarm Rate (BAR^{disc}): BAR^{disc} = (No. of discrimination-stage background alarms)/(arbitrary constant).

Note that the quantities P_d^{disc}, P_{fp}^{disc}, P_{ba}^{disc}, and BAR^{disc} are functions of t^{disc}, the threshold applied to the discrimination-stage signal strength. These quantities can therefore be written as $P_d^{disc}(t^{disc})$, $P_{fp}^{disc}(t^{disc})$, $P_{ba}^{disc}(t^{disc})$, and $BAR^{disc}(t^{disc})$.

RECEIVER-OPERATING CHARACERISTIC (ROC) CURVES

ROC curves at both the response and discrimination stages can be constructed based on the above definitions. The ROC curves plot the relationship between P_d versus P_{fp} and P_d versus BAR or P_{ba} as the threshold applied to the signal strength is varied from its minimum (t_{min}) to its maximum (t_{max}) value.[1] Figure A-1 shows how P_d versus P_{fp} and P_d versus BAR are combined into ROC curves. Note that the "res" and "disc" superscripts have been suppressed from all the variables for clarity.

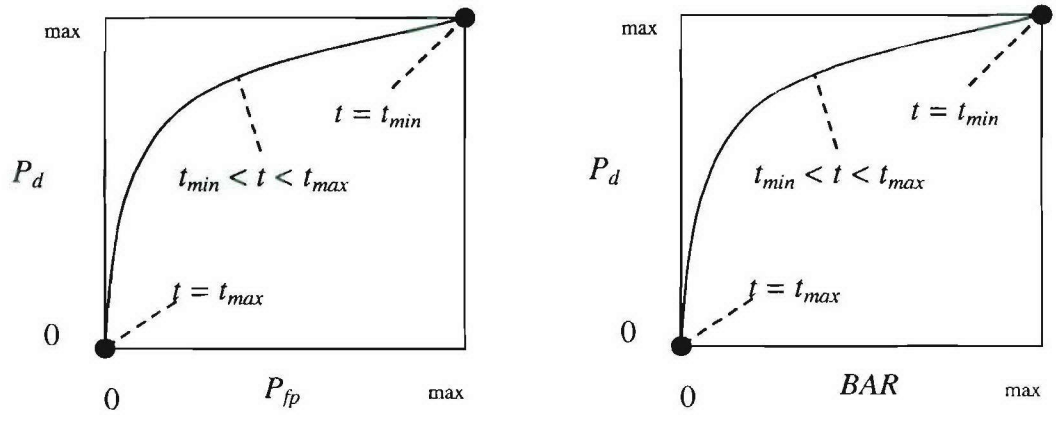

Figure A-1. ROC curves for open field testing. Each curve applies to both the response and discrimination stages.

[1]Strictly speaking, ROC curves plot the P_d versus P_{ba} over a pre-determined and fixed number of detection opportunities (some of the opportunities are located over ordnance and others are located over clutter or blank spots). In an open field scenario, each system suppresses its signal strength reports until some bare-minimum signal response is received by the system. Consequently, the open field ROC curves do not have information from low signal-output locations, and, furthermore, different contractors report their signals over a different set of locations on the ground. These ROC curves are thus not true to the strict definition of ROC curves as defined in textbooks on detection theory. Note, however, that the ROC curves obtained in the Blind Grid test sites are true ROC curves.

METRICS TO CHARACTERIZE THE DISCRIMINATION STAGE

The demonstrator is also scored on efficiency and rejection ratio, which measure the effectiveness of the discrimination stage processing. The goal of discrimination is to retain the greatest number of ordnance detections from the anomaly list, while rejecting the maximum number of anomalies arising from nonordnance items. The efficiency measures the amount of detected ordnance retained by the discrimination, while the rejection ratio measures the fraction of false alarms rejected. Both measures are defined relative to the entire response list, i.e., the maximum ordnance detectable by the sensor and its accompanying false positive rate or background alarm rate.

Efficiency (E): $E = P_d^{disc}(t^{disc})/P_d^{res}(t_{min}^{res})$; Measures (at a threshold of interest), the degree to which the maximum theoretical detection performance of the sensor system (as determined by the response stage tmin) is preserved after application of discrimination techniques. Efficiency is a number between 0 and 1. An efficiency of 1 implies that all of the ordnance initially detected in the response stage was retained at the specified threshold in the discrimination stage, t^{disc}.

False Positive Rejection Rate (R_{fp}): $R_{fp} = 1 - [P_{fp}^{disc}(t^{disc})/P_{fp}^{res}(t_{min}^{res})]$; Measures (at a threshold of interest), the degree to which the sensor system's false positive performance is improved over the maximum false positive performance (as determined by the response stage tmin). The rejection rate is a number between 0 and 1. A rejection rate of 1 implies that all emplaced clutter initially detected in the response stage were correctly rejected at the specified threshold in the discrimination stage.

Background Alarm Rejection Rate (R_{ba}):

Blind Grid: $R_{ba} = 1 - [P_{ba}^{disc}(t^{disc})/P_{ba}^{res}(t_{min}^{res})]$.
Open Field: $R_{ba} = 1 - [BAR^{disc}(t^{disc})/BAR^{res}(t_{min}^{res})])$.

Measures the degree to which the discrimination stage correctly rejects background alarms initially detected in the response stage. The rejection rate is a number between 0 and 1. A rejection rate of 1 implies that all background alarms initially detected in the response stage were rejected at the specified threshold in the discrimination stage.

CHI-SQUARE COMPARISON EXPLANATION:

The Chi-square test for differences in probabilities (or 2 x 2 contingency table) is used to analyze two samples drawn from two different populations to see if both populations have the same or different proportions of elements in a certain category. More specifically, two random samples are drawn, one from each population, to test the null hypothesis that the probability of event A (some specified event) is the same for both populations (ref 3).

A 2 x 2 contingency table is used in the Standardized UXO Technology Demonstration Site Program to determine if there is reason to believe that the proportion of ordnance correctly detected/discriminated by demonstrator X's system is significantly degraded by the more challenging terrain feature introduced. The test statistic of the 2 x 2 contingency table is the

Chi-square distribution with one degree of freedom. Since an association between the more challenging terrain feature and relatively degraded performance is sought, a one-sided test is performed. A significance level of 0.05 is chosen which sets a critical decision limit of 2.71 from the Chi-square distribution with one degree of freedom. It is a critical decision limit because if the test statistic calculated from the data exceeds this value, the two proportions tested will be considered significantly different. If the test statistic calculated from the data is less than this value, the two proportions tested will be considered not significantly different.

An exception must be applied when either a 0 or 100 percent success rate occurs in the sample data. The Chi-square test cannot be used in these instances. Instead, Fischer's test is used and the critical decision limit for one-sided tests is the chosen significance level, which in this case is 0.05. With Fischer's test, if the test statistic is less than the critical value, the proportions are considered to be significantly different.

Standardized UXO Technology Demonstration Site examples, where blind grid results are compared to those from the open field and open field results are compared to those from one of the scenarios, follow. It should be noted that a significant result does not prove a cause and effect relationship exists between the two populations of interest; however, it does serve as a tool to indicate that one data set has experienced a degradation in system performance at a large enough level than can be accounted for merely by chance or random variation. Note also that a result that is not significant indicates that there is not enough evidence to declare that anything more than chance or random variation within the same population is at work between the two data sets being compared.

Demonstrator X achieves the following overall results after surveying each of the three progressively more difficult areas using the same system (results indicate the number of ordnance detected divided by the number of ordnance emplaced):

	Blind Grid	Open Field	Moguls
P_d^{res}	100/100 = 1.0	8/10 = .80	20/33 = .61
P_d^{disc}	80/100 = 0.80	6/10 = .60	8/33 = .24

P_d^{res}: BLIND GRID versus OPEN FIELD. Using the example data above to compare probabilities of detection in the response stage, all 100 ordnance out of 100 emplaced ordnance items were detected in the blind grid while 8 ordnance out of 10 emplaced were detected in the open field. Fischer's test must be used since a 100 percent success rate occurs in the data. Fischer's test uses the four input values to calculate a test statistic of 0.0075 that is compared against the critical value of 0.05. Since the test statistic is less than the critical value, the smaller response stage detection rate (0.80) is considered to be significantly less at the 0.05 level of significance. While a significant result does not prove a cause and effect relationship exists between the change in survey area and degradation in performance, it does indicate that the detection ability of demonstrator X's system seems to have been degraded in the open field relative to results from the blind grid using the same system.

P_d^{disc}: BLIND GRID versus OPEN FIELD. Using the example data above to compare probabilities of detection in the discrimination stage, 80 out of 100 emplaced ordnance items were correctly discriminated as ordnance in blind grid testing while 6 ordnance out of 10 emplaced were correctly discriminated as such in open field-testing. Those four values are used to calculate a test statistic of 1.12. Since the test statistic is less than the critical value of 2.71, the two discrimination stage detection rates are considered to be not significantly different at the 0.05 level of significance.

P_d^{res}: OPEN FIELD versus MOGULS. Using the example data above to compare probabilities of detection in the response stage, 8 out of 10 and 20 out of 33 are used to calculate a test statistic of 0.56. Since the test statistic is less than the critical value of 2.71, the two response stage detection rates are considered to be not significantly different at the 0.05 level of significance.

P_d^{disc}: OPEN FIELD versus MOGULS. Using the example data above to compare probabilities of detection in the discrimination stage, 6 out of 10 and 8 out of 33 are used to calculate a test statistic of 2.98. Since the test statistic is greater than the critical value of 2.71, the smaller discrimination stage detection rate is considered to be significantly less at the 0.05 level of significance. While a significant result does not prove a cause and effect relationship exists between the change in survey area and degradation in performance, it does indicate that the ability of demonstrator X to correctly discriminate seems to have been degraded by the mogul terrain relative to results from the flat open field using the same system.

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APPENDIX B. DAILY WEATHER LOGS

TABLE B-1. WEATHER LOG

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
03/30/2004 07:00:00	37.6	38.2	37	83.6	0
03/30/2004 08:00:00	38.3	39.1	37.8	84.7	0
03/30/2004 09:00:00	39.3	39.9	38.6	84.6	0
03/30/2004 10:00:00	40.3	41.1	39.3	84.6	0
03/30/2004 11:00:00	41.3	42.1	40.6	86.1	0
03/30/2004 12:00:00	42	42.9	41.2	86.5	0
03/30/2004 13:00:00	43.2	44.1	42.1	85.5	0
03/30/2004 14:00:00	44.6	45.5	43.5	84.1	0
03/30/2004 15:00:00	44.6	45.3	43.8	86.9	0
03/30/2004 16:00:00	44.4	44.8	43.8	94.1	0
03/30/2004 17:00:00	44.7	45.3	44.2	97.6	0
03/31/2004 07:00:00	42.9	43.4	42.4	96.9	0
03/31/2004 08:00:00	43.3	43.7	42.9	97.8	0
03/31/2004 09:00:00	44.2	44.8	43.4	96.5	0
03/31/2004 10:00:00	45	45.5	44.4	95	0
03/31/2004 11:00:00	46	47.2	45	95	0
03/31/2004 12:00:00	47.4	48.2	46.7	91.7	0
03/31/2004 13:00:00	48	48.6	47.4	91	0
03/31/2004 14:00:00	48.4	48.9	47.9	90.1	0
03/31/2004 15:00:00	48.8	49.1	48.4	89.7	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
03/31/2004 16:00:00	49.1	49.6	48.5	88.7	0
03/31/2004 17:00:00	49.9	50.5	49.2	87.6	0
04/01/2004 07:00:00	47.7	48.3	47.2	99.1	0.15
04/01/2004 08:00:00	47.9	48.4	47.3	98.5	0
04/01/2004 09:00:00	48.5	49.1	47.9	98.9	0.01
04/01/2004 10:00:00	48.2	49.1	47.6	99.3	0
04/01/2004 11:00:00	48.4	49.4	47.7	97.4	0
04/01/2004 12:00:00	49.8	50.4	49	92.9	0.01
04/01/2004 13:00:00	51.2	52.7	49.6	87.3	0
04/01/2004 14:00:00	50.9	51.5	50.2	82.1	0
04/01/2004 15:00:00	49.9	50.8	49.3	87	0
04/01/2004 16:00:00	49.9	50.5	49.3	87.1	0.01
04/01/2004 17:00:00	47.7	49.6	46.7	94.9	0.14
04/02/2004 07:00:00	45.2	45.6	44.7	97.9	0.06
04/02/2004 08:00:00	45.4	46.1	44.8	98.4	0.08
04/02/2004 09:00:00	46	46.5	45.5	96.6	0.06
04/02/2004 10:00:00	46.6	47.1	46	97.1	0.07
04/02/2004 11:00:00	47	47.3	46.7	96.5	0.06
04/02/2004 12:00:00	47	47.6	46.6	94.4	0.06
04/02/2004 13:00:00	46.8	47.4	46.2	92.6	0.03
04/02/2004 14:00:00	46.4	47	46	93.6	0.07
04/02/2004 15:00:00	46.6	47	46.1	92.3	0.03
04/02/2004 16:00:00	46.7	47.1	46.2	92.4	0.02
04/02/2004 17:00:00	46.6	47	46.2	91.7	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/03/2004 07:00:00	43.3	43.5	42.9	96.4	0
04/03/2004 08:00:00	43.5	44.1	43.1	95.3	0
04/03/2004 09:00:00	44.4	45.3	43.5	93.7	0
04/03/2004 10:00:00	45.7	46.6	44.8	91.8	0
04/03/2004 11:00:00	46.9	47.9	46	90	0
04/03/2004 12:00:00	47.8	48.3	47.2	88.1	0
04/03/2004 13:00:00	48.7	49.4	47.9	83.9	0
04/03/2004 14:00:00	49	49.6	48.5	83.8	0
04/03/2004 15:00:00	48.7	49.4	47.9	88.3	0
04/03/2004 16:00:00	50.4	51.1	49.1	82.3	0
04/03/2004 17:00:00	50.9	51.5	50.5	78.65	0
04/04/2004 07:00:00	41.7	42.4	41.3	93.9	0.09
04/04/2004 08:00:00	42.4	43.4	41.3	94.2	0.01
04/04/2004 09:00:00	42.8	43.9	41.7	86.5	0
04/04/2004 10:00:00	40.5	42.1	39.3	91.1	0.03
04/04/2004 11:00:00	40	41.8	38.8	94.4	0.04
04/04/2004 12:00:00	43.8	46.1	41.7	85.3	0.01
04/04/2004 13:00:00	46.4	47.1	45.9	67.29	0
04/04/2004 14:00:00	46.4	47.1	45.8	61.93	0
04/04/2004 15:00:00	45.7	47.1	45	58.22	0
04/04/2004 16:00:00	45.6	46.2	44.7	54.85	0
04/04/2004 17:00:00	44.9	45.5	44.3	53.84	0
04/05/2004 07:00:00	32.8	33.8	32.3	42.45	0
04/05/2004 08:00:00	33.8	34.9	32.8	38.83	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/05/2004 09:00:00	35.2	36.7	34.5	34.01	0
04/05/2004 10:00:00	37.5	39.1	35.7	32.03	0
04/05/2004 11:00:00	39.2	41	37.9	29.44	0
04/05/2004 12:00:00	41.3	42.4	40.1	27.34	0
04/05/2004 13:00:00	43.6	44.9	42.2	26.51	0
04/05/2004 14:00:00	44.7	45.8	43.6	23.71	0
04/05/2004 15:00:00	46.1	47	45	21.57	0
04/05/2004 16:00:00	46.8	47.6	46	19.38	0
04/05/2004 17:00:00	46.8	47.4	46.4	18.65	0
04/06/2004 07:00:00	32.7	34.9	30.8	44.93	0
04/06/2004 08:00:00	36.6	38	34.7	35.6	0
04/06/2004 09:00:00	40.2	42.3	37.6	25.16	0
04/06/2004 10:00:00	43.8	45.9	41.7	19.79	0
04/06/2004 11:00:00	47.2	49.7	45.1	17.22	0
04/06/2004 12:00:00	50.4	52.2	48.6	16.3	0
04/06/2004 13:00:00	52.9	55.2	51.4	17	0
04/06/2004 14:00:00	55.5	57.1	53.8	19.54	0
04/06/2004 15:00:00	57.3	59	55.8	20.9	0
04/06/2004 16:00:00	58.7	60	57.7	24.38	0
04/06/2004 17:00:00	58.8	59.6	58	25.28	0
04/07/2004 07:00:00	46.9	49.1	45.8	78.66	0
04/07/2004 08:00:00	51.4	53.9	48.8	65.58	0
04/07/2004 09:00:00	56.9	60.6	53.7	45.77	0
04/07/2004 10:00:00	61.1	63.7	59.9	35.09	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/07/2004 11:00:00	66.6	68.8	63.4	32.5	0
04/07/2004 12:00:00	68.9	70.1	67.7	33.8	0
04/07/2004 13:00:00	70.4	71.3	69.3	32.19	0
04/07/2004 14:00:00	71.7	72.4	70.7	29.61	0
04/07/2004 15:00:00	72.8	73.9	71.4	28.5	0
04/07/2004 16:00:00	73.5	73.9	72.7	26.29	0
04/07/2004 17:00:00	73.4	74	72.7	22.99	0
04/08/2004 07:00:00	45.1	48.1	43.4	72.55	0
04/08/2004 08:00:00	48.7	50.5	47.6	60.93	0
04/08/2004 09:00:00	49.4	50.6	48.4	56.13	0
04/08/2004 10:00:00	49.9	50.8	49.1	55.84	0
04/08/2004 11:00:00	50.6	51.7	49.6	54.4	0
04/08/2004 12:00:00	50.3	50.9	49.9	57.83	0
04/08/2004 13:00:00	50.8	51.5	50	60.03	0
04/08/2004 14:00:00	50.8	51.4	50.2	62.81	0
04/08/2004 15:00:00	49.4	50.4	48.8	69.81	0
04/08/2004 16:00:00	49.3	50.2	48.6	67.72	0
04/08/2004 17:00:00	49	49.8	48.1	68.3	0
04/09/2004 07:00:00	46.2	47.3	45.6	93.1	0
04/09/2004 08:00:00	48.3	49.7	47.1	88.1	0
04/09/2004 09:00:00	50.6	53	49.2	78.84	0
04/09/2004 10:00:00	53.5	55.6	52.1	69.39	0
04/09/2004 11:00:00	57	58.9	55.2	57.17	0
04/09/2004 12:00:00	60.1	61.6	58.4	46.17	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/09/2004 13:00:00	61.2	63.4	59.6	45.59	0
04/09/2004 14:00:00	62.2	64.4	60.9	40.91	0
04/09/2004 15:00:00	63.3	64.4	62	35.85	0
04/09/2004 16:00:00	64.2	65.4	62.8	34.72	0
04/09/2004 17:00:00	63.9	64.7	62.3	33.15	0
04/10/2004 07:00:00	39.8	42.8	38.1	72.17	0
04/10/2004 08:00:00	45.5	48.5	42.4	75.64	0
04/10/2004 09:00:00	51.9	55.6	48.2	49.66	0
04/10/2004 10:00:00	55.3	56	54.6	34.91	0
04/10/2004 11:00:00	56.1	57.1	55.4	33.3	0
04/10/2004 12:00:00	57.5	58.3	56.4	32.02	0
04/10/2004 13:00:00	57.9	59.6	56.8	32.8	0
04/10/2004 14:00:00	60.4	61.9	59	30.38	0
04/10/2004 15:00:00	61.3	62.2	60.4	29.93	0
04/10/2004 16:00:00	61.5	62.5	60.9	29.84	0
04/10/2004 17:00:00	61.8	62.7	60.9	30.47	0
04/11/2004 07:00:00	49.2	49.6	48.6	69.36	0
04/11/2004 08:00:00	48.5	49.1	48.2	59.3	0
04/11/2004 09:00:00	48.1	48.9	46.7	56.51	0
04/11/2004 10:00:00	47.2	47.9	46.6	61.23	0
04/11/2004 11:00:00	47.8	48.2	47.4	59.2	0
04/11/2004 12:00:00	47.6	48.2	47	61.57	0
04/11/2004 13:00:00	46.7	47.3	45.5	67.85	0
04/11/2004 14:00:00	44.8	45.9	43.5	82.7	0.01

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/11/2004 15:00:00	43.3	43.7	43	95	0
04/11/2004 16:00:00	43.5	43.9	43.1	97.8	0.01
04/11/2004 17:00:00	44	44.3	43.5	98.2	0
04/12/2004 07:00:00	46	46.5	45.6	80.7	0
04/12/2004 08:00:00	46.8	47.3	46.3	80.1	0.01
04/12/2004 09:00:00	47	47.4	46.6	84.4	0.01
04/12/2004 10:00:00	48.5	49.4	47.2	85.4	0
04/12/2004 11:00:00	48.7	49.4	48.2	84.3	0.01
04/12/2004 12:00:00	48.1	48.6	47.8	90.5	0.07
04/12/2004 13:00:00	47.9	48.3	47.6	93.4	0.05
04/12/2004 14:00:00	47.8	48.3	47.1	94.6	0.09
04/12/2004 15:00:00	47	47.4	46.4	96.1	0.15
04/12/2004 16:00:00	46.3	47	45.8	94.1	0.16
04/12/2004 17:00:00	46	46.2	45.6	91.3	0.04
04/13/2004 07:00:00	45.1	45.6	44.7	100	0
04/13/2004 08:00:00	45.6	46.1	45.2	100	0
04/13/2004 09:00:00	46.3	47	45.6	100	0
04/13/2004 10:00:00	47.3	48.2	46.4	100	0
04/13/2004 11:00:00	48.3	49	47.7	100	0.06
04/13/2004 12:00:00	49.1	49.8	48.6	100	0
04/13/2004 13:00:00	50	50.8	49.5	100	0.03
04/13/2004 14:00:00	51.4	52.2	50.4	100	0
04/13/2004 15:00:00	52.2	52.9	51.7	100	0.01

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/13/2004 16:00:00	53.3	54.4	52.4	100	0.03
04/13/2004 17:00:00	55.4	57.1	53.9	100	0.11
04/14/2004 07:00:00	49.3	49.7	48.9	94.4	0
04/14/2004 08:00:00	49.9	50.2	49.4	93.3	0
04/14/2004 09:00:00	50.1	50.8	49.6	96.8	0.04
04/14/2004 10:00:00	51.2	52.2	50.4	96.9	0
04/14/2004 11:00:00	52.2	52.7	51.8	95.1	0.02
04/14/2004 12:00:00	52.7	53.3	52.1	94.9	0.03
04/14/2004 13:00:00	52.8	53.2	52	92.9	0.01
04/14/2004 14:00:00	51.6	52.2	51	89.7	0.01
04/14/2004 15:00:00	51.3	51.7	51	90.1	0.02
04/14/2004 16:00:00	51.1	51.4	50.8	87.4	0.01
04/14/2004 17:00:00	50.9	51.3	50.5	81.7	0
04/15/2004 07:00:00	47.7	49	46.5	50.29	0
04/15/2004 08:00:00	49.7	50.7	48.6	46.87	0
04/15/2004 09:00:00	51.5	52.9	50.3	44.43	0
04/15/2004 10:00:00	53.3	54.4	52	40.62	0
04/15/2004 11:00:00	55	56	53.9	40.21	0
04/15/2004 12:00:00	56.7	58.3	55	39.52	0
04/15/2004 13:00:00	58.1	59.4	57.1	37.13	0
04/15/2004 14:00:00	59.6	61.2	58.2	33.81	0
04/15/2004 15:00:00	61.1	62.1	60.3	30.3	0
04/15/2004 16:00:00	61.1	61.8	60.4	25.45	0
04/15/2004 17:00:00	61	61.5	60.4	19.35	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/16/2004 07:00:00	43.5	46.3	41	43.85	0
04/16/2004 08:00:00	47.8	49.1	46	37.13	0
04/16/2004 09:00:00	50.3	51.4	48.9	34.45	0
04/16/2004 10:00:00	52.5	53.8	50.8	30.5	0
04/16/2004 11:00:00	55.3	57.1	53.6	28.9	0
04/16/2004 12:00:00	57.8	58.9	56.5	28.72	0
04/16/2004 13:00:00	58.5	59.6	57.2	33.89	0
04/16/2004 14:00:00	59.9	61.4	58.5	32.51	0
04/16/2004 15:00:00	61.5	62.9	60.2	28.79	0
04/16/2004 16:00:00	62.4	63.1	61.9	27.04	0
04/16/2004 17:00:00	62.8	63.4	62.2	25.83	0
04/17/2004 07:00:00	47	52.4	43.3	91.3	0
04/17/2004 08:00:00	53.8	56.1	51.8	77.91	0
04/17/2004 09:00:00	57.6	59.5	55.8	68.22	0
04/17/2004 10:00:00	60.4	62	59	62.89	0
04/17/2004 11:00:00	63.6	65.1	61.5	56.65	0
04/17/2004 12:00:00	66	67.7	64.4	51.59	0
04/17/2004 13:00:00	69.3	71.9	67.2	45.1	0
04/17/2004 14:00:00	73.2	75.2	71.5	39.25	0
04/17/2004 15:00:00	75.7	76.7	74.9	37.66	0
04/17/2004 16:00:00	76.4	77.4	74.6	37.64	0
04/17/2004 17:00:00	76.7	77.4	76.2	38.01	0
04/18/2004 07:00:00	56.1	59.8	53	89.1	0
04/18/2004 08:00:00	62.4	66	59.5	74.6	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/18/2004 09:00:00	68.5	72.2	65.8	59.28	0
04/18/2004 10:00:00	73.9	76	71.6	52.75	0
04/18/2004 11:00:00	77	79.6	74.3	50.49	0
04/18/2004 12:00:00	80.7	82.4	79.2	41.51	0
04/18/2004 13:00:00	82.8	83.4	81.9	37.61	0
04/18/2004 14:00:00	83.9	85.2	83	35.84	0
04/18/2004 15:00:00	85.2	85.8	84.3	38.65	0
04/18/2004 16:00:00	85	85.8	84	38.28	0
04/18/2004 17:00:00	84.9	85.6	84.3	37.77	0
04/19/2004 07:00:00	57.7	63.5	55.3	93.8	0
04/19/2004 08:00:00	65.1	68.8	62.9	79.88	0
04/19/2004 09:00:00	69.9	71.7	68.5	66.2	0
04/19/2004 10:00:00	73	74.8	71.2	60.04	0
04/19/2004 11:00:00	76.5	78	74.3	53.39	0
04/19/2004 12:00:00	79.9	81.6	77.6	46.93	0
04/19/2004 13:00:00	82.4	83.5	80.6	42.6	0
04/19/2004 14:00:00	83.4	84.3	82.2	40.8	0
04/19/2004 15:00:00	83.6	85	82.1	40.54	0
04/19/2004 16:00:00	84.1	85.2	83	40.03	0
04/19/2004 17:00:00	82.5	83.6	81.3	40.62	0
04/20/2004 07:00:00	68.9	71	65.2	58.94	0
04/20/2004 08:00:00	69.9	70.9	68.9	53.29	0
04/20/2004 09:00:00	70.2	71.2	69.2	53.33	0
04/20/2004 10:00:00	70.4	71.4	69.6	52.96	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/20/2004 11:00:00	70.1	71.5	69	53	0
04/20/2004 12:00:00	72	73.9	70.7	48.25	0
04/20/2004 13:00:00	72.8	74	71.6	44.52	0
04/20/2004 14:00:00	74.2	75.3	72.6	40.57	0
04/20/2004 15:00:00	75.7	76.8	74.4	37.13	0
04/20/2004 16:00:00	76.6	78.4	74.6	32.76	0
04/20/2004 17:00:00	73.9	76.6	72.9	40.78	0
04/21/2004 07:00:00	56.3	57.1	55.8	86.6	0
04/21/2004 08:00:00	57.8	59.6	56.4	86.4	0
04/21/2004 09:00:00	60.7	62.1	59	81.6	0
04/21/2004 10:00:00	63.8	65.8	61.5	76.84	0
04/21/2004 11:00:00	66.9	68.6	65.5	72.01	0
04/21/2004 12:00:00	67.8	68.6	67	72.67	0
04/21/2004 13:00:00	66.8	68.2	65.1	76.85	0
04/21/2004 14:00:00	65.7	67.5	64.4	80.8	0
04/21/2004 15:00:00	64.3	66.4	62.4	83.1	0
04/21/2004 16:00:00	63.2	65.1	62.2	83.8	0
04/21/2004 17:00:00	61.5	63.3	60.3	87.2	0
04/22/2004 07:00:00	58.4	62.4	54.2	98.7	0
04/22/2004 08:00:00	64.3	66.7	62.2	87.8	0
04/22/2004 09:00:00	69.5	71.9	66.4	71.55	0
04/22/2004 10:00:00	72.2	73.1	71.4	64.43	0
04/22/2004 11:00:00	74.9	77.3	72.4	59.05	0
04/22/2004 12:00:00	77.3	78.4	76.4	53.63	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/22/2004 13:00:00	78.7	79.5	77.8	49.15	0
04/22/2004 14:00:00	79.7	80.7	79	48.83	0
04/22/2004 15:00:00	78.5	79.9	77.7	46.32	0
04/22/2004 16:00:00	78.6	79.3	78.1	43.25	0
04/22/2004 17:00:00	78	78.7	77	46.44	0
04/23/2004 07:00:00	60.8	63	58.8	93.7	0
04/23/2004 08:00:00	65.4	68.2	62.9	84.6	0
04/23/2004 09:00:00	69.5	71.3	68	74.96	0
04/23/2004 10:00:00	72.6	74.6	70.8	68.51	0
04/23/2004 11:00:00	74.8	76.3	74	64.96	0
04/23/2004 12:00:00	76	77	74.6	65.37	0
04/23/2004 13:00:00	77.2	78.5	76	61.03	0
04/23/2004 14:00:00	77.7	78.2	77	59.63	
04/23/2004 15:00:00	80.4	82.3	77.2	52.4	
04/23/2004 16:00:00	79.6	81.3	78.1	53.06	
04/23/2004 17:00:00	77.3	78.4	72.4	57.88	
04/24/2004 07:00:00	56.4	58.2	54.3	96.1	
04/24/2004 08:00:00	60.1	62.4	57.8	84.4	
04/24/2004 09:00:00	62.9	64.3	61.5	65.86	
04/24/2004 10:00:00	64.5	65.7	63.6	46.88	
04/24/2004 11:00:00	66	67.1	64.9	43.44	
04/24/2004 12:00:00	67.4	68.6	66.4	38.6	
04/24/2004 13:00:00	68.6	69.9	67.5	37.12	0
04/24/2004 14:00:00	69.6	70.6	68.5	36.4	0

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/24/2004 15:00:00	70.8	71.8	69.7	34.22	0
04/24/2004 16:00:00	71.3	72.5	70.4	32.28	0
04/24/2004 17:00:00	71.5	72.4	70.9	32.43	0
04/25/2004 07:00:00	55.1	55.8	54	48.23	0
04/25/2004 08:00:00	56	57	55.2	46.91	0
04/25/2004 09:00:00	56.6	57.6	55.9	47.78	0
04/25/2004 10:00:00	58.5	59.5	57.3	47.91	0
04/25/2004 11:00:00	58.4	58.9	57.8	52.19	0
04/25/2004 12:00:00	58.9	60.4	58	48.5	0
04/25/2004 13:00:00	59.6	60.8	58.5	46.15	0
04/25/2004 14:00:00	59.1	60.1	58	47.5	0
04/25/2004 15:00:00	58.4	59.6	57.6	51.51	0
04/25/2004 16:00:00	56.8	58.6	55.5	63.77	0
04/25/2004 17:00:00	55.5	56	55.1	72.67	0
04/26/2004 07:00:00	63.4	63.9	62.6	98.2	0
04/26/2004 08:00:00	64.7	66.1	63.6	96.5	0
04/26/2004 09:00:00	66.3	66.7	65.7	92.2	0
04/26/2004 10:00:00	66.5	66.9	66.3	90.7	0
04/26/2004 11:00:00	66.9	67.5	66.4	89.7	0
04/26/2004 12:00:00	63	67.2	61.5	94.8	0.15
04/26/2004 13:00:00	62	62.5	61.6	97.3	0
04/26/2004 14:00:00	62.4	62.8	61.9	96.2	0.01
04/26/2004 15:00:00	62.4	62.8	62	96.1	0.01
04/26/2004 16:00:00	61.5	62.5	60.9	96.6	0.02
04/26/2004 17:00:00	61.1	61.4	60.7	98.4	0.05

Date & Time	Average Temperature, °F	Maximum Temperature, °F	Minimum Temperature, °F	Relative Humidity, %	Total Precipitation, in.
04/27/2004 07:00:00	52.6	56	49.1	97.5	0
04/27/2004 08:00:00	57.7	59.2	55.7	77.43	0
04/27/2004 09:00:00	60.5	62	58.7	58.14	0
04/27/2004 10:00:00	62.6	63.8	61.6	40.75	0
04/27/2004 11:00:00	63.2	65	61.6	35.56	0
04/27/2004 12:00:00	64.3	65.7	62.8	32.49	0
04/27/2004 13:00:00	64.3	65.9	63.1	34.21	0
04/27/2004 14:00:00	64.9	66.4	63.8	33.64	0
04/27/2004 15:00:00	63.4	65.6	61.9	36.55	0
04/27/2004 16:00:00	60.6	62	59.1	44.06	0
04/27/2004 17:00:00	57.4	59.4	56.4	53.07	0
04/28/2004 07:00:00	41.5	42.5	40.3	46.61	0
04/28/2004 08:00:00	43.5	44.8	42.2	43.12	0
04/28/2004 09:00:00	45.5	46.6	44.2	40.23	0
04/28/2004 10:00:00	47.8	49.8	46	39	0
04/28/2004 11:00:00	50.3	51.7	48.8	36.23	0
04/28/2004 12:00:00	52.5	54.6	50.6	33.21	0
04/28/2004 13:00:00	54.1	55.3	52.9	32.59	0
04/28/2004 14:00:00	56.4	57.7	54.7	33.51	0
04/28/2004 15:00:00	57.9	59.4	56.2	31.99	0
04/28/2004 16:00:00	59.6	60.9	58.4	31.29	0
04/28/2004 17:00:00	60.5	61.3	59.8	31.6	0

APPENDIX C. SOIL MOISTURE

Date: 30 March 2004
Times: No AM Readings, 1600 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Calibration Lanes	0 to 6	No Readings Taken	39.8
	6 to 12		37.7
	12 to 24		0.9
	24 to 36		4.5
	36 to 48		4.9
Blind Grid/Moguls	0 to 6	No Readings Taken	No readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 31 March 2004
Times: 0715 hours, 1600 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Calibration Lanes	0 to 6	39.2	No Readings Taken
	6 to 12	37.5	
	12 to 24	0.9	
	24 to 36	4.7	
	36 to 48	5.2	
Blind Grid/Moguls	0 to 6	No Readings Taken	4.9
	6 to 12		9.8
	12 to 24		34.9
	24 to 36		36.2
	36 to 48		38.9

Date: 1 April 2004
Times: 0830 hours, 1445 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	No Readings Taken	70.1
	6 to 12		73.8
	12 to 24		70.9
	24 to 36		54.2
	36 to 48		49.7
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	No Readings Taken	17.6
	6 to 12		0.3
	12 to 24		18.7
	24 to 36		21.6
	36 to 48		29.7
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	4.4	No Readings Taken
	6 to 12	9.5	
	12 to 24	35.3	
	24 to 36	36.7	
	36 to 48	38.7	

Date: 2 April 2004
Times: No Readings Taken

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 3 April 2004
Times: 0715 hours, 1830 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	69.9	69.8
	6 to 12	72.3	72.4
	12 to 24	71.7	71.5
	24 to 36	52.9	53.0
	36 to 48	50.3	50.3
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	15.9	15.8
	6 to 12	0.6	0.6
	12 to 24	18.4	18.5
	24 to 36	21.9	21.5
	36 to 48	29.9	29.7
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 5 April 2004
Times: 0730 hours, 1620 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	78.9	78.5
	6 to 12	75.6	75.3
	12 to 24	68.9	69.3
	24 to 36	51.4	52.3
	36 to 48	48.5	48.8
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.6	12.2
	6 to 12	2.1	2.3
	12 to 24	14.8	14.9
	24 to 36	20.5	20.9
	36 to 48	25.7	25.9
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 6 April 2003
Times: 0800 hours, 1400 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	No Readings Taken	79.2
	6 to 12		76.3
	12 to 24		69.8
	24 to 36		52.1
	36 to 48		49.9
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	No Readings Taken	11.9
	6 to 12		2.9
	12 to 24		14.3
	24 to 36		21.9
	36 to 48		27.5
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 7 April 2004
Times: 0715 hours, 1700 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.8	79.3
	6 to 12	77.3	76.9
	12 to 24	69.8	69.1
	24 to 36	52.1	52.4
	36 to 48	49.9	49.5
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	11.8	11.8
	6 to 12	2.5	2.5
	12 to 24	14.9	14.9
	24 to 36	21.6	21.6
	36 to 48	26.9	26.9
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 8 April 2004
Times: 0715 hours, 1900 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.3	79.3
	6 to 12	77.7	76.9
	12 to 24	69.2	69.8
	24 to 36	52.6	52.7
	36 to 48	49.4	49.5
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.3	11.8
	6 to 12	2.7	2.5
	12 to 24	14.9	15.6
	24 to 36	21.6	21.9
	36 to 48	26.9	27.5
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 9 April 2004
Times: 0800 hours, 1400 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 13 April 2004
Times: 0830 hours, 1830 hours

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.9	79.7
	6 to 12	78.3	77.6
	12 to 24	69.6	69.8
	24 to 36	52.8	52.2
	36 to 48	49.7	49.9
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.5	11.9
	6 to 12	2.9	2.8
	12 to 24	15.3	15.5
	24 to 36	21.9	21.7
	36 to 48	26.8	27.0
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 14 April 2004
Times: 0715 hours, 1700 hrs (PM)

Probe Location	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.5	79.6
	6 to 12	78.6	78.2
	12 to 24	69.9	70.5
	24 to 36	53.5	52.9
	36 to 48	50.5	50.6
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.9	12.9
	6 to 12	2.6	2.8
	12 to 24	15.5	15.5
	24 to 36	21.8	21.6
	36 to 48	26.9	27.0
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 15 April 2004
Times: 0715 hours, 1900 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.1	79.2
	6 to 12	78.7	77.9
	12 to 24	69.5	69.9
	24 to 36	53.5	52.7
	36 to 48	50.9	50.3
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.6	12.3
	6 to 12	2.6	2.5
	12 to 24	15.5	15.5
	24 to 36	21.8	21.7
	36 to 48	26.9	27.0
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 16 April 2004
Times: 0730 hours, 1900 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.5	79.9
	6 to 12	78.9	78.3
	12 to 24	69.8	69.8
	24 to 36	52.5	52.2
	36 to 48	49.9	49.5
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.8	12.5
	6 to 12	2.5	2.8
	12 to 24	15.7	15.5
	24 to 36	21.8	21.4
	36 to 48	26.9	27.5
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 17 April, 2004
Times: 0730 hours, 1740 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.5	79.8
	6 to 12	78.6	77.9
	12 to 24	69.5	69.6
	24 to 36	53.6	52.3
	36 to 48	49.8	50.2
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	13.1	12.6
	6 to 12	2.5	2.8
	12 to 24	15.7	15.7
	24 to 36	21.2	21.5
	36 to 48	26.9	27.4
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 19 April 2004
Times: 0715 hours, 1745 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.5	79.5
	6 to 12	78.2	78.5
	12 to 24	69.3	69.4
	24 to 36	52.9	52.4
	36 to 48	49.5	49.8
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.6	12.3
	6 to 12	2.3	2.5
	12 to 24	15.5	15.6
	24 to 36	21.5	21.6
	36 to 48	27.5	27.3
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 20 April 2004
Times: 0730 hours, 1750 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	80.3	79.8
	6 to 12	78.5	77.4
	12 to 24	69.2	69.5
	24 to 36	52.1	52.6
	36 to 48	49.1	49.5
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.4	12.1
	6 to 12	3.2	2.9
	12 to 24	15.6	15.4
	24 to 36	21.5	21.4
	36 to 48	26.7	27.4
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 21 April 2004
Times: 0710 hours, 1730 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.5	79.6
	6 to 12	78.0	77.9
	12 to 24	68.2	68.6
	24 to 36	52.9	52.5
	36 to 48	49.1	49.5
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.3	11.5
	6 to 12	2.4	2.7
	12 to 24	15.4	15.7
	24 to 36	21.8	21.4
	36 to 48	26.2	26.5
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 22 April 2004
Times: 0715 hours, 1830 hours

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.2	79.5
	6 to 12	78.5	77.4
	12 to 24	69.5	69.5
	24 to 36	51.8	52.0
	36 to 48	49.6	49.8
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.8	12.4
	6 to 12	2.5	2.7
	12 to 24	15.2	15.2
	24 to 36	21.5	21.6
	36 to 48	26.9	27.2
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date: 23 April 2004
Times: 0800 hours, No PM Readings

Probe Location:	Layer, in.	AM Reading, %	PM Reading, %
Wet Area	0 to 6	79.2	No Readings Taken
	6 to 12	78.7	
	12 to 24	70.2	
	24 to 36	53.5	
	36 to 48	49.5	
Wooded Area	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Open Area	0 to 6	12.2	No Readings Taken
	6 to 12	3.2	
	12 to 24	15.8	
	24 to 36	21.2	
	36 to 48	27.5	
Calibration Lanes	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		
Blind Grid/Moguls	0 to 6	No Readings Taken	No Readings Taken
	6 to 12		
	12 to 24		
	24 to 36		
	36 to 48		

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
3/30/2004	2	CALIBRATION LANE	1030	1200	90	INITIAL MOBILIZATION	1	INITIAL MOBILIZATION	GPS	NA	LINEAR	CLOUDY	MUDDY
3/30/2004	2	CALIBRATION LANE	1200	1230	30	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	CLOUDY	MUDDY
3/30/2004	2	CALIBRATION LANE	1230	1340	70	INITIAL MOBILIZATION	1	INITIAL MOBILIZATION	GPS	NA	LINEAR	CLOUDY	MUDDY
3/30/2004	2	CALIBRATION LANE	1340	1350	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY
3/30/2004	2	CALIBRATION LANE	1350	1540	110	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
3/30/2004	2	CALIBRATION LANE	1540	1550	10	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
3/30/2004	2	CALIBRATION LANE	1550	1620	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	CALIBRATION LANE	800	925	85	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	CALIBRATION LANE	925	1120	115	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	CALIBRATION LANE	1120	1140	20	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	CALIBRATION LANE	1140	1310	90	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	BLIND TEST GRID	1310	1525	135	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
3/31/2004	3	BLIND TEST GRID	1525	1540	15	DOWNTIME MAINTENANCE CHECK	7	CHANGE BATTERY	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	BLIND TEST GRID	1540	1550	10	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
3/31/2004	3	BLIND TEST GRID	1550	1640	50	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/1/2004	3	BLIND TEST GRID	900	1030	90	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	RAINY	MUDDY
4/1/2004	3	BLIND TEST GRID	1030	1100	30	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	RAINY	MUDDY
4/1/2004	3	OPEN FIELD	1100	1230	90	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	RAINY	MUDDY
4/1/2004	3	OPEN FIELD	1230	1330	60	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	RAINY	MUDDY
4/1/2004	3	OPEN FIELD	1330	1600	150	DOWNTIME MAINTENANCE CHECK	7	DATA CHECK	GPS	NA	LINEAR	RAINY	MUDDY
4/1/2004	3	OPEN FIELD	1600	1630	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	RAINY	MUDDY
4/2/2004	3	OPEN FIELD	1500	1630	90	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	745	1215	270	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	1215	1300	45	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	CLOUDY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/3/2004	3	OPEN FIELD	1300	1320	20	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	1320	1340	20	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	1340	1620	160	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	1620	1700	40	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	1700	1750	50	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/3/2004	3	OPEN FIELD	1750	1820	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/5/2004	3	OPEN FIELD	800	1115	195	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1115	1200	45	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1200	1220	20	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1220	1430	130	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1430	1440	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1440	1520	40	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/5/04	3	OPEN FIELD	1520	1525	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1525	1535	10	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1535	1540	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/5/2004	3	OPEN FIELD	1540	1600	20	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	745	905	80	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	905	925	20	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	925	1035	70	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1035	1045	10	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1045	1240	115	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1240	1250	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1250	1350	60	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1350	1410	20	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/6/2004	3	OPEN FIELD	1410	1425	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1425	1700	155	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1700	1710	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1710	1740	30	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/6/2004	3	OPEN FIELD	1740	1830	50	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	745	920	95	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	920	930	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	930	1245	195	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	1245	1250	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	1250	1310	20	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	1310	1340	30	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/7/2004	3	OPEN FIELD	1600	1620	20	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/7/2004	3	OPEN FIELD	1620	1645	25	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/8/2004	3	OPEN FIELD	745	940	115	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	940	950	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	950	1050	60	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1050	1100	10	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1100	1125	25	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1125	1140	15	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1140	1340	120	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1340	1350	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1350	1420	30	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1420	1715	175	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1715	1725	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/8/2004	3	OPEN FIELD	1725	1800	35	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/8/2004	3	OPEN FIELD	1800	1830	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/9/2004	3	OPEN FIELD	745	930	105	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/9/2004	3	OPEN FIELD	930	945	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	CLOUDY	MUDDY
4/9/2004	3	OPEN FIELD	945	1200	135	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/9/2004	3	OPEN FIELD	1200	1220	20	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	CLOUDY	MUDDY
4/9/2004	3	OPEN FIELD	1220	1245	25	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	CLOUDY	MUDDY
4/13/2004	3	OPEN FIELD	900	1140	160	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1140	1245	65	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1245	1345	60	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1345	1355	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1355	1555	120	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	RAINY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/13/2004	3	OPEN FIELD	1555	1605	10	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1605	1700	55	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1700	1705	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1705	1725	20	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	RAINY	MUDDY
4/13/2004	3	OPEN FIELD	1725	1805	40	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	745	1115	210	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	1115	1240	85	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	1240	1250	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	1250	1525	155	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	1525	1535	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	1535	1600	25	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	RAINY	MUDDY
4/14/2004	3	OPEN FIELD	1600	1630	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	RAINY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/15/2004	3	OPEN FIELD	800	830	30	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	830	840	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	840	910	30	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	910	1110	120	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1110	1115	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1115	1150	35	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1150	1320	90	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1320	1430	70	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1430	1450	20	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1450	1740	170	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1740	1755	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/15/2004	3	OPEN FIELD	1755	1810	15	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/15/2004	3	OPEN FIELD	1810	1830	20	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	745	1010	145	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1010	1025	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1025	1305	160	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1305	1310	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1310	1350	40	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1350	1415	25	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1415	1430	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1430	1610	100	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1610	1620	10	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1620	1730	70	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1730	1740	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/16/2004	3	OPEN FIELD	1740	1810	30	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/16/2004	3	OPEN FIELD	1810	1840	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	845	1045	120	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1045	1100	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1100	1200	60	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1200	1230	30	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1230	1240	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1240	1425	105	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1425	1450	25	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1450	1600	70	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1600	1610	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/17/2004	3	OPEN FIELD	1610	1650	40	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/17/2004	3	OPEN FIELD	1650	1715	25	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	745	950	125	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	950	1005	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	1005	1320	195	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	1320	1325	5	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	1325	1425	60	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	1425	1620	115	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/19/2004	3	OPEN FIELD	1620	1650	30	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	750	820	30	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	820	835	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	835	1125	170	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1125	1135	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/20/2004	3	OPEN FIELD	1135	1220	45	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1220	1250	30	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1250	1310	20	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1310	1450	100	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1450	1500	10	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1500	1530	30	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1530	1540	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1540	1610	30	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/20/2004	3	OPEN FIELD	1610	1720	70	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	745	810	25	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	810	820	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	820	1015	115	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/21/2004	3	OPEN FIELD	1015	1025	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1025	1110	45	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1110	1135	25	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1135	1245	70	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1245	1340	55	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1340	1415	35	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1415	1535	80	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1535	1545	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1545	1630	45	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/21/2004	3	OPEN FIELD	1630	1710	40	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	750	815	25	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	815	830	15	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	830	910	40	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/22/2004	3	OPEN FIELD	910	920	10	MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	920	930	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	930	1145	135	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1145	1245	60	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1245	1350	65	DAILY START/STOP	3	SET UP GRIDS	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1350	1400	10	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1400	1410	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1410	1700	170	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1700	1710	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1710	1740	30	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/22/2004	3	OPEN FIELD	1740	1800	20	DAILY START/STOP	3	END OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY
4/23/2004	3	OPEN FIELD	820	925	65	DAILY START/STOP	3	START OF DAILY OPERATIONS	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Operational Status	OP Stat Code	Operational Status - Comments	Track Method	Track Method=Other Explain	Pattern	Field Conditions	
4/23/2004	3	OPEN FIELD	925	935	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/23/2004	3	OPEN FIELD	935	1155	140	COLLECT DATA	4	COLLECT DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/23/2004	3	OPEN FIELD	1155	1205	10	CALIBRATE	2	CALIBRATE WITH METAL RING	GPS	NA	LINEAR	SUNNY	MUDDY
4/23/2004	3	OPEN FIELD	1205	1250	45	DOWNTIME MAINTENANCE CHECK	7	DOWNLOAD/CHECK DATA	GPS	NA	LINEAR	SUNNY	MUDDY
4/23/2004	3	OPEN FIELD	1250	1315	25	LUNCH/BREAK	5	LUNCH/BREAK	GPS	NA	LINEAR	SUNNY	MUDDY
4/28/2004	3	OPEN FIELD	1800	1845	45	DEMOBILIZATION	10	DEMOBILIZATION	GPS	NA	LINEAR	SUNNY	MUDDY
4/29/2004	3	OPEN FIELD	730	930	120	DEMOBILIZATION	10	DEMOBILIZATION	GPS	NA	LINEAR	SUNNY	MUDDY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

APPENDIX E. REFERENCES

1. Standardized UXO Technology Demonstration Site Handbook, DTC Project No. 8-CO-160-000-473, Report No. ATC-8349, March 2002.

2. Aberdeen Proving Ground Soil Survey Report, October 1998.

3. Data Summary, UXO Standardized Test Site: APG Soils Description, May 2002.

4. Yuma Proving Ground Soil Survey Report, May 2003.

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APPENDIX F. ABBREVIATIONS

AEC	=	U.S. Army Environmental Center
APG	=	Aberdeen Proving Ground
ASCII	=	American Standard Code for Information Interchange.
ATC	=	U.S. Army Aberdeen Test Center
ERDC	=	U.S. Army Corps of Engineers Engineering Research and Development Center
ESTCP	=	Environmental Security Technology Certification Program
EQT	=	Army Environmental Quality Technology Program
ERDC	=	Engineering Research and Development Center
GPS	=	Global Positioning System
HEAT	=	high-explosive, antitank
JPG	=	Jefferson Proving Ground
POC	=	point of contact
QA	=	quality assurance
QC	=	quality control
ROC	=	receiver-operating characteristic
RTK	=	real time kinematic
SERDP	=	Strategic Environmental Research and Development Program
UXO	=	unexploded ordnance
YPG	=	U.S. Army Yuma Proving Ground

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